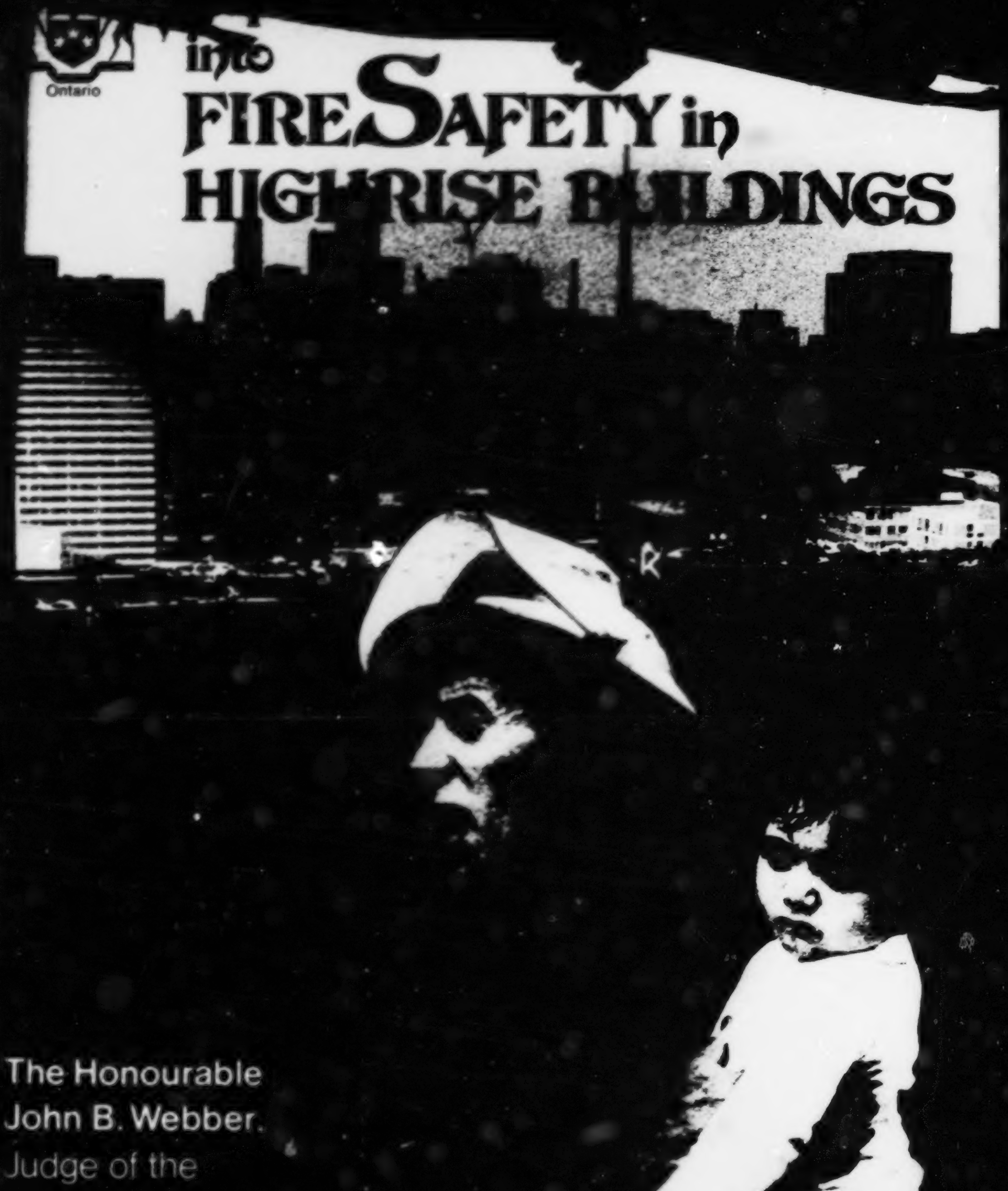
Ontario

into FIRE SAFETY in HIGHRISE BUILDINGS



The Honourable
John B. Webber,
Judge of the
County Court
of the County
of Dufferin,
Commissioner

Ontario

REPORT OF THE PUBLIC INQUIRY INTO FIRE SAFETY IN HIGHRISE BUILDINGS

The Honourable John B. Webber
Judge of the County Court of the County of Dufferin
Commissioner

December 1983
Volume 1

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His Honour, Judge
John B. Webber
Commissioner
Victor L. Freidin
Counsel

Public Inquiry into Fire Safety
in Highrise Buildings

416/963-2024

180 Dundas St. W.
20th Floor
Toronto, Ontario
M5G 1Z8

The Honourable George W. Taylor, Q.C.
Solicitor General
Ministry of the Solicitor General
25 Grosvenor Street, 11th Floor
Toronto, Ontario
M7A 1Y6

Dear Mr. Solicitor General:

On the 30th of June, 1982, I was duly appointed a sole Commissioner to inquire into the subject of fire safety in highrise buildings in Ontario and to report as to such changes to laws or practices and procedures and such other recommendations as might be appropriate with a view to improving the standard of fire safety in highrise buildings.

Having performed the duties as set out in the Order-in-Council, I submit herewith my report.

Commissioner

December, 1983

Order-In-Council

A copy of the Order-in-Council approved by His Honour the Lieutenant-Governor, on the recommendation of the Solicitor General, dated the 30th of June, 1982:

On the recommendation of the undersigned, the Lieutenant Governor, by and with the advice and concurrence of the Executive Council, orders that

WHEREAS the occurrence of fires in highrise buildings is a matter of concern to the public, the Government of Ontario, the Fire Marshal and fire departments in the Province of Ontario,

AND WHEREAS such fires endanger the lives and property of citizens in Ontario and create the need for examining possible improved measures aimed at fire safety,

Pursuant to the provisions of the *Public Inquiries Act*, R.S.O. 1980, chapter 411, His Honour John B. Webber, Judge of the County Court of the County of Dufferin, be appointed a Commissioner to inquire into the subject of fire safety in highrise buildings in Ontario and, more particularly,

1. to assess the dangers to which occupants are exposed when a fire occurs in a highrise building
2. to assess the public's understanding of the action that should be taken in the event of a fire and evaluate the need for public education programs; and to assess the public's perception as to whether occupancy of highrise buildings is especially hazardous and if so, why
3. to assess the value of fire safeguards required by law
4. to examine the effectiveness of fire prevention inspections conducted in highrise buildings by public and private agencies
5. to recommend changes to laws or practices and procedures and make such other recommendations as may be appropriate with a view to improving the standard of fire safety in highrise buildings.

It is further ordered that all Government Ministries, Boards, Agencies and Commissions, shall assist His Honour Judge Webber to the fullest extent in order that he may carry out his duties and functions, and that he shall have authority to engage such counsel, investigators and other staff as he deems proper at rates of remuneration and reimbursement to be approved by the Management Board of Cabinet, and that the Ministry of the Attorney General will be responsible for providing administrative support to the Inquiry.

COMMISSION STAFF

The Honorable John B. Webber, Judge of the County Court of the County of Dufferin — Commissioner

Victor L. Freidin — Counsel

Kathleen C. Murphy — Assistant to Counsel

Doris E. Wagg, Administrator

Natalie Gold, Secretary to Commission

Karen Price, Secretary to Commission

Research: Rebecca J. Quance
Kathleen C. Murphy
R. Roy Philippe, P. Eng.

Support Staff: Carroll Brooks

COUNSEL APPEARING BEFORE THE INQUIRY

Mr. L. H. Iron, Q.C.	— Counsel for PTE Industries Inc.
Mr. Karl Jaffary, Q.C. and Mr. John Petrosoniak (Student-at-law)	— Counsel for Urban Development Institute, Apartment Group; Housing and Urban Development Association of Canada, Ontario Council; Metropolitan Toronto Apartment Builders Association.
Ms. A. T. Kowalishin	— Counsel for City of Toronto.
Mr. L. Margulies	— Counsel for Berhold Investments Ltd.
Mr. B. S. Onyschuk, Q.C. and Mr. C. MacFarlane	— Counsel for Canadian Institute of Public Real Estate Companies; International Council of Shopping Centres, Canadian Committee; Building Owners and Managers Association.

AGENTS APPEARING BEFORE THE INQUIRY

Ms. Mary Ann Cummings and Mr. Christopher Dassios	Parkdale Community Legal Services for Federation of Metropolitan Toronto Tenants' Associations

Preface

The administration of a Public Inquiry requires special expertise. Mr. Roland J. d'Abadie, Chief Administrative Officer of Royal Commissions and Inquiries in the Ministry of the Attorney General, never failed to respond to any request made of him. He was always available to guide me through the mysteries of government administration. Miss Doris E. Wagg, the Registrar of the Administration Offices, with unfailing good humour solved the various administrative problems almost as quickly as I created them. Miss Wagg kept our library in order with a fully indexed system. She was of invaluable assistance in reviewing many of the briefs and exhibits and summarizing them for future reference.

Miss Natalie Gold, the original secretary to the Inquiry, created the necessary system to keep track of the ever increasing mounds of paper and answered many questions raised by the media, parties, legal counsel and all others interested in the Inquiry.

The proper presentation of the evidence was aided by much research, not only by counsel, but by others to allow counsel to prepare for the hearings. Prior to the commencement of the hearings, Mr. Roy Philippe and Mr. Antonio Chow both of the Office of the Fire Marshal provided the necessary background information and research materials for counsel. Notwithstanding other onerous duties, including his position as Chief of Consulting Services in the Office of the Fire Marshal, Mr. Philippe continued to provide guidance to staff regarding the technical aspects of highrise fire safety.

As the Inquiry continued, additional research was necessary. Much of this research was done by Kathleen Murphy and Becky Quance. As illustrative of their abilities, they not only produced considerable material for the Inquiry, but they attended and successfully completed the Bar Admission Course and were called to the Bar of Ontario in the Spring of 1983. They both approached their tasks with diligence and intelligence and responded in the best possible way to the heavy pressure put upon them.

The secretarial staff answered the public's questions and kept the office routine under control. Miss Karen Price assumed responsibility for the office after Miss Gold left. Miss Price continued to keep the paperwork in order and produced draft after draft of material which was necessary to produce this report. The AES operator, Mrs. Carroll Brooks, cheerfully prepared the final report, notwithstanding continuous and numerous alterations to each and every Chapter.

The court reporter, Mr. Les Homans, deserves my thanks. He was most cooperative and did his utmost to provide quick and accurate transcripts.

To Chief Judge W.D. Lyon and his predecessor, Chief Judge William Colter, and my brother and sister judges who arranged their schedules to undertake my regular judicial duties, I express my appreciation. As a result of their fine efforts, not only did my judicial workload receive the attention that it required, but I will return to a current court list.

Associated with the efforts of these judges were Mr. Thom Collyer and Mr. Ross Lamont, the Sheriff/Clerk and Deputy Sheriff/Clerk, respectively, of the County of Dufferin. They contended with my lengthy absence with grace and ability, never allowing those who needed judicial service to be neglected.

The briefs submitted, the evidence and the submissions contained careful and concerned commentary on highrise fire safety. Those persons who took the time to prepare briefs, to present evidence and generally to be involved in the work of the Inquiry have my thanks for their cooperation and assistance.

Any trial depends greatly on presentation by counsel. An inquiry increases the necessity for proper presentation due to the length of the process and the numerous issues involved and the far-reaching scope of the material. I was fortunate to have as counsel, Victor L. Freidin, who was appointed by the Solicitor General. He was ably assisted by Kathleen Murphy during her time as a Bar Admission student and then as a member of the Bar.

Their efforts were superior. In their preparation and presentation of the evidence, and in Mr. Freidin's final submissions, I could not have asked for greater attention to detail. They cooperated fully not only with me during the Hearings, but also with all those who came in contact with the Inquiry. They spent many long hours on the work of the Inquiry.

To say all went smoothly with Commission Counsel would be wrong. There were times when our views about many issues differed. This statement is not a criticism. Mr. Freidin and Ms. Murphy presented views which they, as responsible, independent counsel, believed should be espoused. The dialogue arising therefrom was of immeasurable assistance in causing me to rethink or reassess my understanding of the numerous issues. Their grasp of the issues and the presentation of the same, at times seemed to make my task more difficult, yet it was, in the final analysis, absolutely essential.

Originally, I planned to write the final report without assistance. Once I embarked on that endeavour it became clear that the writing of the report would extend over an excessive period of time, and that without assistance it would be difficult for one person to ensure that the report would be cohesive and clear to those who did not hear all the evidence. I therefore extended the invitation to Mr. Freidin and Ms. Murphy to become actively involved in the process. At that point in time, they were both ready to return to regular practice and could not have been faulted if they refused. They both accepted this additional burden with enthusiasm. The diligence revealed during the Inquiry continued during the preparation of the report. If this report improves life safety in highrise buildings and clearly sets forth the issues and problems which exist, then they are entitled to claim much of the credit.

Not only did the final report receive the benefit of their inquiring minds, but it received the critical assessment of three other persons. Miss Wagg corrected my spelling, punctuation and grammar and created sense of unwieldly and illogical construction. Becky Quance, with the knowledge gained as a researcher, carefully and diplomatically suggested how the text could be more understandable to all who chose to read it. As I was impressed with the thorough knowledge of Mr. Roy Philippe, I deemed it appropriate that he be further involved as a consultant to review the technical aspects of the report. The final decision as to what should be done with various technical matters was always mine, but Mr. Philippe's understanding of technical matters and most importantly, his presentation of these matters in language that I could understand, made my task much less difficult. For his efforts, he deserves the thanks of those that find the report understandable from a technical point of view.

I express my thanks to the Photo Editor of the Toronto Star, Mr. Peter Robertson, for permission to use the photograph of the firefighter and child which appears on the cover of this report.

Personally, I found the Inquiry to be an extremely interesting task. It became all consuming, especially the effort of creating the final report which caused me to think of little else. My wife, who always supports my endeavours, graciously accepted my preoccupation and for that I express my gratitude.

Introduction

The Inquiry was established by Order-in-Council dated June 30, 1982. On September 13, 1982 a preliminary sitting was held to outline the procedures to be followed and to consider applications for standing. Standing was granted to all those who sought it. In my opinion, they had "a substantial and direct interest in the subject matter of [the] Inquiry" as required by the *Public Inquiries Act*. In accordance with Section 5 of the Act, those with standing were given "an opportunity during the Inquiry to give evidence and to call and examine or to cross-examine witnesses personally or by. . .counsel on evidence relevant to [their] interest." All those who did not seek standing but wished to give evidence or address the Inquiry, were advised that they could do so.

The formal hearings began on November 1, 1982. There were 67 days of hearings including final submissions, which ended on June 6, 1983. The writing of the final report included a review of all materials and evidence.

The hearing process was entirely open. No *in camera* hearings were requested or required. A conscious effort was made to provide information and background to all who asked, especially the media. The media attended a number of the sittings. I congratulate them on their unobtrusive use of mechanical recording devices.

The Inquiry received the evidence of 75 witnesses. Many of those witnesses were highly qualified in their fields. Assessments of the qualifications of all witnesses may be made by reference to their Curriculum Vitae found in Volume 2. The Inquiry also received 93 written briefs and accepted 316 Exhibits which are listed in Volume 2. Three documents were received after the hearings ended. They were made the last three Exhibits in order to record all material received by the Inquiry.

The Inquiry has based many of its findings on the study of a number of fires in highrise buildings. The benefit of that study was not limited to the identification of specific problems. Hearing evidence of actual fires made it easier for me to appreciate the evidence of many witnesses who dealt with technical matters.

The recommendations in this report should be considered with the following four matters in mind.

First, some of the recommendations may have been implemented prior to the release of this report. As there is so much activity in the field of highrise fire safety this is not an unexpected result. Proposed amendments to the Ontario Building Code, the *Hotel Fire Safety Act*, and unproclaimed sections of the *Fire Marshals Act* were reviewed by the Inquiry, and are the subject of recommendations. The hearings ended in June 1983. Since that time, some of these amendments have come into force.

Second, some of the recommendations have application to fire safety in general, and are not limited to highrise buildings.

Third, the report contains technical and scientific material relating to highrise fire safety. The material is included for a proper understanding of the issues. Where necessary, some technical or scientific matters are the subject of a general or broad recommendation which may include a suggestion for future study.

Finally, this was a provincial Inquiry. Some recommendations bear on matters which can only be controlled by federal legislation or action. I do not believe it is appropriate or proper to make specific recommendations suggesting amendments to federal statutes. I am hopeful that the mention of these problems will cause both the provincial government and the public, including the fire service, to institute appropriate and vigorous dialogue with the federal government.

This report involves four basic areas: Chapters 1 and 2 detail the issues arising from the Terms of Reference and legislation. Chapters 3 through 6 describe a number of fires in four types of highrise buildings; apartments, hotels, offices and institutions.

Chapters 7 through 10 are primarily concerned with the systems or hardware found in highrise buildings. Chapters 11 through 15 bring into focus the human aspects of fire safety. While it is my view that the systems and hardware are of great importance, the understanding of the human aspect is critical for the improvement of life safety.

Information is contained in Volume 2 which will allow the reader to examine the material reviewed by the Inquiry and to appreciate the breadth of the Hearings. It is hoped that this information will also assist those who wish to conduct further research.

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Chapter 1

Terms of Reference

DEFINITION OF HIGHRISE BUILDINGS:

The Order-in-Council (Exhibit 1), which includes the terms of reference, directed the Inquiry "to inquire into the subject of fire safety in highrise buildings in Ontario".

The Ontario Building Code (OBC) classifies buildings by breaking down typical occupancies into groups. In very general and broad terms, the groups identified in the OBC are as follows:

Group A — Assembly buildings, which contain occupancies such as movie houses and theatres.
Group B — Institutional buildings, which include hospitals and correctional facilities.
Group C — Residential buildings, which contain occupancies used for sleeping accommodations, such as apartments and hotels.
Group D — Office buildings, which are occupancies for conducting business and rendering of professional and personal services.
Group E — Mercantile buildings, which are occupancies for the displaying, or the selling of retail goods, such as department stores.
Group F — Industrial buildings, which may constitute a special fire hazard but are rarely highrise buildings, e.g. a paint factory.[1]

The criterion most often used by the public to determine if a building is a highrise or not is whether any storeys are beyond the reach of a fire department aerial ladder for the purpose of firefighting and rescue. The Building Code, however, employs other criteria.

The OBC contains a Subsection entitled "Additional Requirements for High Buildings" (3.2.6). The buildings which must comply with those additional requirements are the highrise buildings which are the subject of this report. That Subsection states:

> 3.2.6.1.(1) This Subsection applies to,
> (a) every building of Group A, D, E, or F major occupancy classification that is more than,
> (i) *120 ft* in height, measured between grade and the floor level of the top storey, or
> (ii) *60 ft* in height, measured between grade and the floor level of the top storey, and in which the cumulative or total occupant load in a building on or above any storey above grade, other than the first storey, divided by the number of 22-in. units of exit width in all exit stairs at that storey, exceeds 300 persons;
> (b) every building containing a Group B major occupancy located more than *60 ft* above grade;
> (c) every building containing a floor area or part of a floor area, located above the *third storey* designed or intended

as Group B occupancy for patients in bed or infirm persons;

(d) every building which is a Group C major occupancy apartment building that is more than,
   (i) *6 storeys* in building height, or
   (ii) *60 ft* in height measured between the floor level of the top storey and grade; and

(e) every building containing any other Group C major occupancy located more than 60 ft above grade.[2] (italics added)

Generally speaking a highrise apartment building or hotel is one which is over six storeys in height; and a highrise office or mercantile building is one which is 12 storeys or higher. A hospital is considered to be a highrise if it exceeds three storeys.

When considering the various building classifications, the same height is not used for each classification to distinguish between highrise and lowrise buildings. The use of different heights is a recognition that risks differ depending upon building classification. For example, the OBC differentiates between hospitals, which contain non-ambulatory patients, and other highrise buildings. It also treats buildings with sleeping accommodation differently from those without such accommodation. The ability to evacuate the expected population of a building by stairs is a further consideration.

Recommendation:

1.1 The definition of highrise buildings contained in Sentence 3.2.6.1.(1) of the Ontario Building Code should be retained. However consideration should be given by building code authorities to eliminating the references to "between grade and floor level" and "above grade".

The reference to grade allows those who build to go through substantial grade alterations simply to avoid the requirements of the section, a practice which is neither logical nor practical.

Recommendation:

1.2 Agencies which keep fire records should use the same definition of "highrise buildings".

The evidence revealed that authorities such as the Ontario Fire Marshal, Statistics Canada, CMHC and others employ different definitions of "highrise buildings" when collecting statistical information. The height used varies from five to seven storeys. This causes confusion when one set of statistics is compared to another.

TERMS OF REFERENCE:

The preamble to the Terms of Reference identifies the occurrences of fire, the potential dangers to life and property from fire, and the need for improvement of fire safety as the concerns giving rise to this Inquiry. In order to deal with those concerns, the Terms of Reference directed me:

1. "to assess the dangers to which occupants are exposed when a fire occurs in a highrise building
2. to assess the public's understanding of the action that should be taken in the

event of a fire and evaluate the need for public education programs; and to assess the public's perception as to whether occupancy of highrise buildings is especially hazardous and if so, why

3. to assess the value of fire safeguards required by law
4. to examine the effectiveness of fire prevention inspections conducted in highrise buildings by public and private agencies, and
5. to recommend changes to laws or practices and procedures and make such other recommendations as may be appropriate with a view to improving the standard of fire safety in highrise buildings."

The process conceived by the Terms of Reference, and followed by the Inquiry, was to obtain the greatest input from all members of society interested in fire safety in highrise buildings. The public was therefore advised of the Inquiry and given the opportunity to apply for standing, to make written submissions to the Inquiry, or appear as witnessess during the hearing process (Exhibit 2). This invitation resulted in the submission of 93 written briefs and evidence from 75 witnesses.

In order to fulfill my mandate it has been necessary to discuss many issues which relate to the general study of fire risk, in addition to matters which are clearly applicable to highrise buildings only. Although this caused the hearings to be somewhat longer than originally anticipated, consideration of those matters was essential to a proper evaluation of fire safety in highrise buildings.

The major topics which arose during the Inquiry have been made the subject of individual Chapters. Most Chapters will contain recommendations; but for a list of all recommendations contained in the Report, reference should be made to Volume 2, Part C.

In this Chapter, I intend to state in general terms my conclusions in relation to the Terms of Reference. The conclusions are based on all the evidence, some of which is reviewed in the Chapters which follow.

1) "TO ASSESS THE DANGERS TO WHICH OCCUPANTS ARE EXPOSED WHEN A FIRE OCCURS IN A HIGHRISE BUILDING."[3]

The word "occupant" is defined in the Ontario Fire Code (OFC) as follows:

> Occupant means any person, firm or corporation who is jointly responsible with an owner in respect of the property under consideration over which the occupant has control.

This is a very narrow definition, and is the subject of a recommendation in Chapter 15. References to "occupants" in this report are not governed by this narrow definition, but mean "occupants" in the normal sense, that is persons who occupy a building at any time for any purpose.

"The Dangers"

Submissions were received which cautioned that a mere list of the dangers would not effectively "assess" the dangers as required by this Term of Reference.

One view was that when I "assess the dangers", I should consider those dangers in comparison to other dangers in life. If it was my mandate to decide how society should spend its limited financial resources in order to get the best return for its money in terms of reducing death and/or injuries, I would have to compare the dangers to which occupants of highrise buildings are exposed to other dangers in life such as being killed or injured in motor vehicle accidents or dying of various diseases. I do not regard this as part of my mandate and therefore the issue of whether limited financial resources should be spent on highrise fire safety as opposed to other concerns of society is not a matter for this report.

Some witnesses urged that in "assessing the dangers" I must not restrict the assessment to a consideration of the chance of fires occurring, but must consider both the direct and indirect consequences of fires. I agree that it is necessary to consider not only the chance of a fire occurring, but also all of the potential consequences of that fire when "assessing the dangers". A proper evaluation of risk always requires a consideration of both factors.

An appreciation of the dangers to which occupants of highrise buildings are exposed can be gained by merely identifying common sources of ignition, events or conditions which can exacerbate a fire or affect the ability of firefighters to engage successfully in suppression and/or rescue, and the results of fires.

Common Sources of Ignition:

— careless use of smoking materials
— electrical malfunctions
— cooking equipment
— arson

Events or Conditions which can Exacerbate the Fire or Affect the Ability of Firefighters to Engage Successfully in Suppression and/or Rescue:

— lack of a fire safety plan
— lack of fire safety education particularly regarding the appropriate action for occupants to take in a fire situation, and tenant apathy with respect to fire safety education
— improper functioning of fire safety equipment such as alarms, voice communication, or emergency power, because of improper installation and/or maintenance
— improper construction practices which defeat the intent of the Building Code, such as poking holes through walls that were intended to be fire separations, and failing to properly repair the breach
— failure to implement basic fire safety rules within the building, or follow the most basic fire safety principles. These failures result in problems such as the build-up of combustible materials, inaccessible fire safety equipment, and fire doors being propped open
— lack of adequate firefighter access to buildings and to the fire floor, firefighter reliance on building services which fail, and inability to vent the fire floor
— the characteristics of the fire load, including contents and interior finishes
— inadequate inspection

Results of Fire:

Heat and smoke are two products of combustion. In highrise fires, smoke is the primary cause of injuries and death. One peculiarity of highrise buildings is the phenomenon of "stack effect". This is the tendency of the air movement in a high building to duplicate air movement in a chimney. The result of this is to draw smoke from lower floors to higher floors. A more detailed description of stack effect and methods of dealing with it are found in Chapter 7. As will be seen in the case studies in Chapters 3 through 6, the characteristics of smoke, and its migration, are major dangers.

Statistics:

Traditionally, assessment of danger or risk has been done on an intuitive basis, or as a response to a specific incident. The above lists identify dangers, but in order to assist the Inquiry to assess danger on a more reliable basis, or to assess the degree of those dangers, statistical evidence was received from a number of sources.

The Fire Marshal of Ontario is specifically charged with the duty to keep records and statistical information in respect of fire, and to report annually to the Solicitor General.[4] Since 1976, the OFM has kept statistics on computer, and those statistics formed the most comprehensive data reviewed by the Inquiry.[5] The Inquiry also reviewed statistics from some other Provinces, and American sources.

Because the Ontario statistics are more relevant to this Inquiry and appear to be among the most comprehensive available, the conclusions drawn below are based primarily on that information.

(1) There are in Ontario approximately 3100 highrise buildings as defined by the Ontario Building Code.

(2) Of that number, about 80% or 2500 buildings are residential occupancies (over *six* stories).

(3) Of the total population in Ontario, about 18.4% live in highrise buildings.

(4) There is no statistical base for determining the number of persons who occupy highrise office or mercantile buildings.

(5) From 1976 to 1981, there were no deaths reported resulting from fires in highrise office buildings (Office and mercantile occupancies over *twelve* stories). A limited number of injuries were reported in the same period.

(6) From 1976 to 1981 there were deaths reported resulting from fires in highrise hotels in two years, 1980 and 1981.

(7) Unlike other occupancies, there is information available which allows a comparison to be made of death and injury rates as between highrise apartments and other residences. Generally speaking, the death rate in highrise apartment buildings is approximately half that of other residences. The injury rate is about one-third higher in highrise apartment buildings than in other residences. The injury rate for highrise buildings may be understated because of the difficulty of canvassing a large population after a fire.

(8) A comparison of per capita dollar loss as between highrise apartments and other residences shows that the reported dollar loss per person in highrise apartment fires is less than half that of persons in other residences.

(9) A fire in a highrise apartment has rarely resulted in multiple deaths.

(10) Deaths in fires occurring in highrise buildings are most likely to occur in the room of fire origin.

(11) About two-thirds of all fires in highrise apartments and hotels *that resulted in deaths* were caused by smoking materials.

This information alone is of limited value without exploring the reasons for the results. This exploration will be done in the following Chapters.

Although fairly comprehensive fire loss statistics are kept in Ontario, I believe there is room for improvement. To achieve that end, I make the following Recommendations.

Recommendation:

1.3 *The Office of the Fire Marshal should maintain a catalogue of all highrise buildings in Ontario.*

The Chief Fire Official in each municipality is presently required to classify the buildings in the municipality by major occupancy (OFC 2.1.2.1.). It would seem a simple matter for a catalogue of these buildings to be made available to the Fire Marshal. The value in this exercise for the municipality is that it would help to identify its fire service needs and would facilitate the enforcement of the Ontario Fire Code. The value for the Fire Marshal would arise from an accurate identification of the number of highrise buildings and the possibility of obtaining a fairly accurate population base. It will allow the Fire Marshal to monitor the progress in the preparation of fire safety plans as required by the Ontario Fire Code. Finally, it will help him in discharging his duty to advise and assist municipalities and fire departments as required by the *Fire Marshals Act*.[6]

There is a catalogue of hotels being developed by the Hotel Fire Safety Services Unit of the Office of the Fire Marshal. The purposes of that list are similar to the purposes described above.

Recommendation:

1.4 *Fire Occurrence Reports should include a description of the exact location of and the condition of the sprinkler system and information describing the proximity of sprinklers to the area of fire origin.*

It was clear when examining statistics gathered in Ontario and elsewhere that there is a need to provide clearer and unambiguous information regarding the proximity of sprinklers to the area of fire origin. For example, a survey done by the Building Owners and Managers Association (BOMA) described a number of buildings as "sprinklered" and suggested that fires in many of these buildings were not controlled by the sprinkler system (Brief 34). It was clear, however, that buildings listed as "sprinklered" included *partially* sprinklered buildings, the most common situation according to Mr. Donald Boehmer. It would be unfair to suggest that the system failed to extinguish a fire if the sprinklers were in the basement and the fire elsewhere. This information is needed in order to properly evaluate the efficiency of sprinklers.

Recommendation:

1.5 *Fire Occurrence Reports should include, along with the age and condition of the affected building, a rough categorization of the building code under which it was constructed.*

It is my understanding that many of the building by-laws in force throughout the province before the passing of the OBC were, like the OBC, based on the National Building Code. In other cases, such as the City of Toronto, the building by-law was unique.

The Chief Fire Official would be aware of the history of building codes in his jurisdiction and should be able to indicate which code was in effect at the time of construction of a particular building.

A uniform reporting method containing this information could be devised and added to the Occurrence Report form. At present, the Annual Report of the Fire Marshal does compile some information about occurrence by age of the building and total fire loss. In my view, the data as presently reported does not assist in answering the question "What effect does the alteration of building codes have on our fire record?" The evaluation of changing technology is one of the essential ingredients in predicting future risks. The additional information would be useful in analyzing benefits obtained from regulation.

Recommendation:

1.6 The Office of the Fire Marshal with the cooperation of the Chief Fire Officials should assist in collecting data for further study of human behaviour in fire occurrences for the purpose of testing assumptions made about human behaviour.

Dr. John Bryan, who has studied human behaviour in fires for many years, testified that persons who have been involved in a fire are most willing and anxious to share their experiences. It is my view that the collection of information from persons involved in fires will assist in code writing and in the preparation of fire safety plans. I believe that Chief Fire Officials are overwhelmingly responsive to requests made of them for information, and that fire department personnel should be used to collect this type of information. A more detailed discussion of the significance of studying human behaviour in fires is contained in Chapter 14.

Recommendation:

1.7 Owners and occupants of highrise buildings as part of a 3 year test program should be required to report to the local fire department all fires that cause more than $500 damage, if not reported as presently required by an insurer or a Fire Department, together with the causes of the fire, if known, and the method of suppression.

At present, fires are reported to the Office of the Fire Marshal if there is a fire department response or if there is an insurance claim.[7] With the current information, it is difficult to assess whether there is a significant number of unreported fires. If the information gained through this program indicated that a significant number of fires had not been reported in the past, this would establish a limitation to be used in the future when relying on the Fire Loss Reports for the province. It would also indicate the benefits and limitations of first aid firefighting.

The implementation of such a test program will require contact between fire officials and building owners and managers. These parties are presently in contact due to the requirements to prepare and approve fire safety plans. This affords an excellent opportunity to put such a test program into place.

Recommendation:

1.8 The Ontario Fire Marshal should collaborate fully with other Canadian Fire Marshals and Fire Commissioners in the implementation of a national fire statistical system, and process the data promptly for use while current.

A similar recommendation was made by the authors of the Study on Fire Prevention and Control Systems in Canada (Exhibit 84). The reason for the recommendation was expressed as follows:

> "It is important to the intelligent handling of the fire problem that adequate statistics be promptly collected and fully assessed."[8]

I heartily endorse this recommendation.

It has been suggested that in the past, legislative change has occurred from the application of theoretical concepts or facts determined from one spectacular fire. I hope that the additional statistical data, as recommended, will provide a more accurate foundation for legislative change.

Although, as I have pointed out, there are difficulties arising from the inadequacies of the statistics, I have been able to list and assess a number of the dangers. The major danger to which occupants are exposed when a fire occurs in a highrise building is smoke. Most deaths and injuries arise from inhalation of smoke. Smoke also prevents egress to safe areas, thereby increasing exposure to injury or death.

As stated earlier, risks vary depending on the occupancy. For example, a fire at 3:00 a.m. in a sleeping occupancy such as an apartment building or a hotel poses a greater risk to life safety than the same fire in a highrise office building. The need to distinguish between occupancies is the major reason I have dealt with apartments, hotels, offices and institutions in separate Chapters.

2) "TO ASSESS THE PUBLIC'S UNDERSTANDING OF THE ACTION THAT SHOULD BE TAKEN IN THE EVENT OF A FIRE AND EVALUATE THE NEED FOR PUBLIC EDUCATION PROGRAMS; AND TO ASSESS THE PUBLIC'S PERCEPTION AS TO WHETHER OCCUPANCY OF HIGHRISE BUILDINGS IS ESPECIALLY HAZARDOUS AND IF SO, WHY"

Understanding of the action that should be taken:

In order to arrive at some conclusion about the understanding people have of the proper action to be taken in a fire, the Inquiry examined a number of information pamphlets,[9] conducted a survey in highrise apartments and hotels,[10] studied actual actions in fires, received evidence from witnesses[11], and received written briefs from the fire service, those in the business of fire protection, and the owners and occupants of highrise buildings.[12]

It is my view that the public's understanding is not at a satisfactory level. This view is supported by some sample comments taken from the briefs:

> "It is our department's experience that the public lacks understanding as to the action to be taken in the event of a fire in a highrise building. Recent tragic fires that have been headlined have, for a short time, increased the public's desire to learn what to do in the event of a fire in a highrise building." (Brief 60)
>
> "It sometimes seems that if they do think about fire at all, everyone has his own opinion as to what to do in the unlikely event of a fire. Most of us lack the practical or technical knowledge base to make an informed decision. Most of us think it could never happen to us." (Brief 58)

> "We believe that the public has little understanding regarding the appropriate action to be taken in the event of a fire. This is partly due to the varied information which they receive from well-meaning informed sources." (Brief 53)
>
> "The matter of public awareness of what to do in the case of a highrise fire is an area that, in our opinion, requires a great deal of study and quick action to educate the general public in the proper course of action." (Brief 29)

There is a single exception. There is ample evidence to demonstrate that people are aware that they are not to use elevators in the event of a fire.[13] The rule "Do not use the Elevator" is straightforward, simple and clear. It is reasonable to assume, at least in part, that this is the reason people remember it. To the extent that people have been given other instructions, I cannot find that those instructions have been as clear. They have been complex (sometimes by necessity) and contradictory.

I appreciate that it is difficult to formulate simple rules for behaviour in a complex and rapidly changing event such as a fire emergency. However, people find it frustrating when they ask for advice and either they are told there are no set rules, or they are given different advice by different experts.

I saw examples of direct contradictions in information distributed to the public. Most experts tell people to evacuate at once if they can. At least one fire department gives out literature advising people to stay in the suite until told to leave (Exhibit 180).

In a questionnaire prepared for occupants of apartment buildings for the Inquiry by Dr. Ann Cavoukian, a number of questions dealt directly with actions to be taken in the event of a fire (Exhibit 185).

Question 1: Respondents were asked to list the actions they would take in the event of a fire in the building. The two most frequent responses were to pull the fire alarm and to vacate the premises.

TABLE 1.1

QUESTION 1: ACTION TAKEN IN THE EVENT OF A FIRE

	No.	%
PULL FIRE ALARM	320	53.8
VACATE PREMISES	296	49.7
CALL FIRE DEPARTMENT/911	227	38.2
ALERT SUPERINTENDENT/TENANTS	157	26.4
AVOID ELEVATORS	139	23.4
STAY IN APARTMENT	96	16.1
GO OUT ON BALCONY	62	10.4
CLOSE WINDOWS/DOORS	46	7.7
USE FIRE EXTINGUISHERS/HOSES	44	7.4
TRY TO LOCATE SOURCE OF FIRE	39	6.6
PUT WET TOWELS/CLOTHS AGAINST CRACK IN DOOR	35	5.9
CLOSE DOOR AFTER EXITING	33	5.5
AWAIT INFORMATION/INSTRUCTIONS	7	1.2
AVOID STAIRS	6	1.0
OTHER	26	4.4

Question 3: Upon hearing a fire alarm about half of the respondents would take what I consider "positive" action, as distinct from those who would be more passive.

TABLE 1.2

QUESTION 3: ACTION TAKEN IN RESPONSE TO FIRE ALARMS

	No.	%
TAKE ACTION	246	41.0
CALL SUPERINTENDENT	59	9.8
CHECK HALLWAY	235	39.2
IGNORE ALARM	60	10.0

Questions 7 and 8: If aware of smoke in the hallways, about one third of the respondents would still attempt to evacuate. This reinforces Dr. John Bryan's observation that, in spite of the danger it poses, people will move through smoke.

Question 10: A list of actions taken if remaining in the apartment is found in the following table. The responses demonstrate that the occupants of highrise apartments have considered the peril of smoke and methods to avoid it.

TABLE 1.3

QUESTION 10: ACTION TAKEN IF REMAINING IN APARTMENT

	No.	%
PUT WET TOWELS/CLOTHS BY CRACK OF DOOR/ SEAL DOORS/WET DOOR	390	74.1
GO OUT ONTO THE BALCONY/EXIT BY BALCONY	210	39.9
CLOSE DOORS/WINDOWS/VENTS	188	35.7
FILL THE BATHTUB	28	5.3
CONTACT SUPERINTENDENT/INFORM SOMEONE OF PRESENCE IN APT./CALL FOR HELP	26	4.9
CALL FIRE DEPARTMENT	23	4.4
OPEN WINDOWS	22	4.2
PUT WET TOWEL/CLOTH ON FACE	22	4.2
REMAIN CLOSE TO FLOOR	15	2.9
TURN OFF APPLIANCES/AIR CONDITIONING	14	2.7
UNLOCK DOOR	10	1.9
OTHER	64	12.1

Question 21: On average, two thirds of the respondents felt that they knew what to do in the event of a fire, with the highest socio-economic group having a substantially higher confidence in their knowledge. Confidence is not the same thing as really understanding the action to be taken.

Dr. Cavoukian conducted a similar survey in hotels with the following responses:

Question 1: The responses show that a much higher number of persons would take "positive" action in hotels than they would in their own apartment. Dr. Cavoukian said that people are likely to feel more protected and safe in their own homes than in a hotel, and therefore are less likely to take action in their home.

TABLE 1.4

QUESTION 1: ACTION TAKEN IN RESPONSE TO FIRE ALARM (HOTELS)

	No.	%
EXIT BY STAIRS	468	60.9
CALL FRONT DESK	161	20.9
STAY IN ROOM	117	15.2
EXIT BY ELEVATOR	14	1.8
IGNORE ALARM	9	1.2

Question 2: A list of actions taken if remaining inside the hotel suite is found in the following table. The responses again demonstrate that guests in hotels have considered the peril of smoke and the methods of dealing with it.

TABLE 1.5

QUESTION 2: SAFETY PRECAUTIONS TAKEN WHEN STAYING IN ROOM (HOTELS)

	No.	%
TOWELS/WET TOWELS AGAINST DOOR	430	65.0
CLOSE WINDOWS, DOORS	251	37.9
LIE ON FLOOR	123	18.6
WET TOWELS/BLANKETS/SHEETS	64	9.7
OPEN WINDOWS, DOORS	59	8.9
FILL TUB WITH WATER	57	8.6
GO ON BALCONY	37	5.6
LOOK FOR SMOKE	28	4.2
STAY NEAR WINDOW/SIGNAL FOR HELP	25	3.8
OTHER	113	17.1

Question 6: Most people reported that they knew the location of fire exits. Over 90% of those who had read the instructions in the hotel room knew where the exits were.

Question 7: Again, about two-thirds of the respondents believed they knew what to do in the event of a fire, with a higher level of confidence being exhibited by those who had noticed fire safety information in the hotel room.

I was concerned that the survey, being composed of hypothetical questions, might not reflect the actual actions taken in a real fire situation. Dr. John Bryan, a very highly respected researcher into human behaviour in actual fires, advised the Inquiry that the results of the survey correlated very closely to results he has obtained in studying behaviour in actual hotel fires.

In addition to the questionnaire, the Inquiry studied specific fires in order to assess the public's understanding of the action they should take in a fire. The fires are described in Chapters 3 through 6.

The action taken by an occupant in a fire can affect both himself and others. When assessing the understanding of the action that should be taken from this perspective, some of the observed behaviour indicates clearly that occupants do not fully understand the proper action to be taken. For example, I am aware of situations where the door to the suite of fire origin has been left open by persons fleeing the fire. According to a study done by the Ontario Housing Corporation (OHC), in 1981 this occurred in 72 out of 93 fires in their highrise apartment buildings (Exhibit 159). The result of this is to greatly exacerbate the amount of smoke moving out of the suite of fire origin and into other areas of the building, increasing the danger to other occupants.

Occupants who open the door to the roof can greatly endanger the lives of others, especially those who are in the stairwells, by accelerating stack action and thereby increasing smoke migration into the stairwells.

Serious problems arise when people fail to move out of stairwells when they become logged with smoke. If smoke is encountered in a stairwell, it is imperative for the occupants to know that the choices include re-entry to other floors, refuge in *any* suite (not only their own) and exit to a balcony. Because of the construction or configuration of most highrise buildings, there are generally some areas that remain tenable. The actions of occupants in the fires reviewed by the Inquiry show a lack of understanding of the availability of these alternatives. This bears directly on the need for education.

Need for Public Education:

The issue of evaluation of the need for public education needs no extended comment at this point. I simply state that public education is absolutely essential. The content and methods of such programs will be dealt with in Chapter 13.

Public Perception of Hazard:

The assessment of public perception is especially challenging due to the wide divergence of opinion.[14] There are strongly held views that highrise buildings are extremely dangerous; there are equally strong views that they are very safe indeed. Further, the Inquiry was advised both that people are anxious about their safety *and* that generally people consider highrise buildings firesafe.

The Inquiry attempted to assess public perception by using the questionnaire done by Dr. Cavoukian, and by relying on briefs and witnesses who spoke to this issue.

In order that the reader can appreciate the range of views expressed, I list some of the comments from the briefs.

> Millions of people use highrise buildings each day. If the public perceives them as being especially dangerous from a fire safety point of view, it must be a very deeply sublimated perception (Brief #4).
>
> Very few people think about fire, and if they do, they all have a different opinion — generally people consider highrise

> buildings firesafe and less hazardous than other buildings (Brief #58).
>
> The public lacks understanding and perceives that living in a highrise building is hazardous (Brief #63).
>
> The public has little understanding and perceives hotels as more hazardous (Brief #53).

Roy Philippe of the Office of the Fire Marshal testified that, in order to measure perception of risk, it is necessary to have some benchmark. In her report, Dr. Cavoukian chose to measure the respondents perception of risk in highrise buildings as compared to lowrise buildings and houses.

Question 14: The table below clearly illustrates that 67.5% of the respondents were of the opinion that highrise apartments were more dangerous than houses.

TABLE 1.6

QUESTION 14: HIGHRISE MORE DANGEROUS THAN A HOUSE

	No.	%	
MUCH MORE DANGEROUS	233	38.6	67.5
SOMEWHAT MORE DANGEROUS	174	28.9	
NO DIFFERENCE	82	13.6	
SOMEWHAT LESS DANGEROUS	84	13.9	18.9
MUCH LESS DANGEROUS	30	5.0	

Question 15: The next table illustrates that the response was similar when respondents were asked to compare highrises to lowrises, although it appears that the lowrise was considered somewhat more dangerous than a house.

TABLE 1.7

QUESTION 15: HIGHRISE MORE DANGEROUS THAN A LOWRISE

	No.	%	
MUCH MORE DANGEROUS	197	33.1	69.6
SOMEWHAT MORE DANGEROUS	217	36.5	
NO DIFFERENCE	88	14.8	
SOMEWHAT LESS DANGEROUS	73	12.3	15.7
MUCH LESS DANGEROUS	20	3.4	

Question 19: When asked whether they were afraid of the possibility of fires in their buildings, the response was equally divided; 49.5% answered that they were afraid, while 50.5% said that they were not.

Question 20: A large majority of the respondents (83.4%) believed that *their* building was safe to live in.

A question similar to question 19 was asked of hotel guests. Dr. Cavoukian reported that, when asked whether they were concerned about the risk of fires in hotels, respondents answered as follows:

TABLE 1.8

QUESTION 5: CONCERN OVER RISK OF FIRES IN HOTELS

	No.	%
VERY CONCERNED	233	29.9
SOMEWHAT CONCERNED	314	40.4
NOT SURE	21	2.7
SLIGHTLY CONCERNED	161	20.7
NOT AT ALL CONCERNED	49	6.3

If those who live in highrise apartment buildings actually believe them to be more hazardous than other residences, it should be noted that this view is inconsistent with the actual fire record.

When reviewing the responses to Question 14 and Question 15, I was concerned as to how these responses could be rationalized with the response to Question 20.

Dr. Cavoukian resolved this concern by explaining that it is not unusual for there to be a difference between the perception of hazard in the abstract and the perception of a threat to one's personal safety in one's own home. In everday language — "It can't happen to me."

It is interesting to note that an individual's perception of personal safety within his own home is probably a more accurate reflection of the potential for injury or death as reported in the actual fire record, than is the belief which was reported by the majority of the respondents to the questionnaire that, as a class, highrise buildings are more dangerous than other residences.

In comparing the opinions expressed by individual witnesses and in various briefs regarding public perception to the results in Dr. Cavoukian's report, it is my view that the results of the questionnaire provide more reliable information about the perception of the hazards by occupants of highrise apartment buildings and those who use hotels, than do those individual opinions.

The final question is — Why do these occupants perceive these buildings as a class to be more hazardous than other residential buildings? In my opinion, this is the result of confusion over what to do in the event of a fire, the difficulty in evacuating a highrise building, and the dramatic news coverage of recent highrise fires.

The survey conducted by Dr. Ann Cavoukian was restricted to the occupants of highrise apartment buildings and guests in highrise hotels. No similar survey was conducted of the public at large, or of occupants of highrise office buildings or institutional buildings.

Information received by the Inquiry did, however, indicate some specific concerns relating to fire safety in highrise office and institutional buildings. For example, there was concern regarding doors to exit stairwells being locked from the inside, the inability to communicate with occupants in many highrise office buildings, and the lack of a fire alarm system in some highrise office buildings.

Evidence was also received from which I can deduce that those in charge of highrise office buildings perceive risks which must be addressed. For example, they are asking for advice from the fire service and preparing emergency procedures.

These facts, together with the confusion over what to do in the event of a fire, the difficulty of evacuating a highrise building, and the dramatic news coverage of recent highrise fires (none of which are phenomena unique to highrise apartments) allows me to conclude that the public's perception is that highrise building occupancy is hazardous. Although this evidence allows me to make the assessment that there is a perception of hazard, it does not, in any way, assist me in assessing the degree of hazard that these persons believe exists.

In my view, it makes little difference whether the public perceives the occupancy of highrise buildings to be "hazardous" or, to use the words of the Order-in-Council, "especially hazardous". The existence of the perception on either basis can and must become one of the catalysts to improve the public's approach to fire safety.

Counsel for those who own or manage highrise buildings urged me to find that such buildings were indeed very safe places, and that the public should not perceive highrise buildings to be hazardous. They suggested that this report tell the public that highrise buildings were not hazardous. On the other hand, one witness suggested that, since many tenants of highrise apartment buildings have an illusion that living in a highrise building means you are safe from fire, I could encourage a more positive attitude to fire safety by shattering any such illusion.

I am concerned that neither a bold assertion that highrise buildings are not hazardous, nor a statement which might "shatter any such illusion" would be accurate or appropriate. In my view, what is required is for people to understand the positive and the negative aspects related to the occupancy of highrise buildings. It is hoped that this report will, to some degree, enhance their understanding. Although my recommendations indicate there is still much to be done, based on the evidence, I believe that a positive attitude regarding fire safety in highrise buildings is justified. Those persons involved in the fire service, the Office of the Fire Marshal (OFM), and many representatives of the design professions, all expressed a real desire to improve the fire safety record. In addition, there was evidence that the desire by the public for information and guidance in relation to the fire safety in highrise buildings is, at the present time, greater than it has ever been. I am hopeful that the proper interaction between these groups together with the implementation of my recommendations will result in an improved level of fire safety in highrise buildings in Ontario.

3) "TO ASSESS THE VALUE OF FIRE SAFEGUARDS REQUIRED BY LAW"

The National Research Council is a world renowned institution which is involved in various areas of research including the construction of buildings and associated fire safety.

> "The National Building Code of Canada (NBC) is prepared by the Associate Committee on the National Building Code (ACNBC) and is published by the National Research Council (NRC). It is prepared in the form of a model code to permit adoption by an appropriate authority. It is essentially a recommended uniform code of minimum regulations for public health, fire protection and structural sufficiency with respect to buildings."[15]

The National Fire Code is prepared in a similar fashion through the Associate Committee on the National Fire Code.

> "The National Fire Code is essentially a recommended uniform code of minimum requirements designed to ensure an acceptable standard of fire prevention, fire fighting provisions and life safety in existing buildings and of fire prevention within the community at large."[16]

The NBC and NFC have been described as companion documents, and, if adopted by the "authority having jurisdiction", regulate both new construction and fire safety in existing buildings.

The OBC and the OFC are based on these model Codes. The fire safeguards provided for in these Codes are, therefore, among the most advanced in the world.

The Ontario *Hotel Fire Safety Act* (HFSA) and its predecessors have existed since 1888 and as detailed in Chapter 4 is in the midst of a revision which in my opinion will provide for a high level of life safety in hotels.

It is my opinion that the present fire safeguards required by law are generally adequate. This does not mean that changes are not needed.[17] Specific recommendations for amendments to provincial legislation, including the three major pieces of legislation referred to above, are generally dealt with in Chapter 2, and where appropriate in other Chapters.

4) "TO EXAMINE THE EFFECTIVENESS OF FIRE PREVENTION INSPECTIONS CONDUCTED IN HIGHRISE BUILDINGS BY PUBLIC AND PRIVATE AGENCIES"

The effectiveness of fire prevention inspections by both public and private agencies is not satisfactory at the present time.[18]

Most inspections made by public agencies are made as part of the enforcement procedures described in the OBC, OFC and *Hotel Fire Safety Act*. The frequency of these inspections is affected by the number of inspectors. During the Inquiry, those responsible for public inspections emphasized the inability to provide the desired level of inspection due to limited financial resources.

The quality of inspections by public agencies is dependent on the level of training of the individual inspector.

The training of building officials is presently piece-meal. A formal course is being developed for building officials, and will hopefully increase the effectiveness of inspections relating to new construction.

The academic training of fire prevention inspectors is provided primarily by the Office of the Fire Marshal, either through the Fire College in Gravenhurst, or, in the case of hotel inspectors, through the extensive training program developed within the Hotel Fire Safety Services Unit of the Office of the Fire Marshal.

In larger municipalities training is also received through the local fire department. A more detailed discussion of education relating to public inspectors is found in Chapters 12 and 13.

For the purpose of this report, inspections by private agencies include both the inspections performed by tradesmen in order to assess the need for repairs or alterations, and those required to be performed by building owners and managers pursuant to the Ontario Fire Code.

The effectiveness of the inspections performed by tradesmen varies. The same can be said for building owners and managers. Recommendations to improve the effectiveness of the inspections by tradesmen and owners and managers are contained in Chapters 12 and 15, respectively.

The evidence discloses in the case of both public and private agencies, that inspections, records of inspections, involvement of the fire departments, and reporting of deficiencies should be improved.

5) "TO RECOMMEND CHANGES TO LAWS OR PRACTICES AND PROCEDURES AND MAKE SUCH OTHER RECOMMENDATIONS AS MAY BE APPROPRIATE WITH A VIEW TO IMPROVING THE STANDARD OF FIRE SAFETY IN HIGHRISE BUILDINGS"

The recommendations appear in the text of this report as the various items are discussed. Volume 2, Part C contains a collection of all of my recommendations.

Donal Baird, in the brief for The Fire Underwriters Survey which he prepared and in his evidence given before the Inquiry, urged a broad approach rather than a narrow approach to fire safety. He suggested that the Inquiry should consider the general area of fire safety as opposed to being restricted to highrise buildings. Mr. Baird's comments urging the Inquiry to adopt a broad overview were, in my opinion, valuable because they did remind the Inquiry of the dangers of a restrictive approach to the issues. It will become readily apparent that action taken with regard to highrise matters may well have substantial influence on the whole fire safety field.

[1] Ontario Building Code, Table 3.1.2A; Exhibit 21.

[2] Quotations from the OBC are taken from the Revised Regulations of Ontario, 1980 Reg. 87. Reference should also be made to the publication "Metric Equivalents for the Building Code".

[3] Some of the briefs which address this term of reference in detail are: 4, 6, 15, 16, 17, 25, 26, 27, 29, 30, 33, 34, 35, 40, 41, 42, 45, 52, 61, 64, 65, 66, 71, 75, 77, 78 and 81.

[4] *Fire Marshals Act*, R.S.O. 1980, C.166, s.3(g) and R.R.O. 1980, Reg. 394.

[5] Exhibits 3-20, 31, 36, 37, 63, 90, 146, 235, 236, 244, 246 and 303.

[6] *Fire Marshals Act*, R.S.O. 1980, C.166, s.3 (b), (e), (f) and (h).

[7] *Fire Marshals Act*, R.S.O. 1980, C.166, s. 8(2) and 9(1).

[8] Exhibit 84, p. 101.

[9] Exhibits 44, 48, 49, 190 and 229.

[10] Exhibit 185.

[11] i.e.: Wretham; Exhibit 144.

[12] Some of the briefs which address this issue in detail are: 4, 17, 26, 29, 30, 34, 41, 53, 58, 60, 62, 63, 64, 71, 75, 77, 79, 81, 84 and 86.

[13] For example, Exhibit 185, p. 16.

[14] Some of the briefs that address this issue in detail are: 4, 17, 26, 29, 30, 34, 41, 53, 58, 60, 62, 63, 64, 71, 75, 77, 79, 81, 84 and 86.

[15] Exhibit 79, p. ix.

[16] Exhibit 80, p. ix.

[17] Some of the briefs that address this issue in detail are: 4, 6, 15, 17, 26, 29, 30, 34, 39, 41, 51, 52, 53, 54, 56, 58, 60, 63, 64, 65, 66, 67, 70, 71, 78 and 89.

[18] Some of the briefs that address this issue in detail are: 4, 13, 15, 17, 27, 30, 32, 34, 36, 39, 45, 49, 51, 53, 58, 59, 60, 63, 65, 67, 70, 71 and 78.

Chapter 2

The Legislation

The major Acts which govern fire safety in Ontario are the *Building Code Act* (BCA), the *Fire Marshals Act* (FMA), and the *Hotel Fire Safety Act* (HFSA). Although a number of the sections of these Acts will be discussed, the large majority of the regulatory provisions governing construction and the maintenance of buildings from a fire safety point of view are found in the regulations to those Acts — that is, in the OBC, OFC, and HFSA Regulations.

Ontario Building Code:

The purpose of the OBC with respect to fire safety is to "establish the standard of fire safety for the construction of new buildings, the reconstruction of buildings including extensions or material alterations, and the elimination of unsafe conditions in matters not covered by the Fire Code" (Exhibit 226).

Prior to December 31st, 1975, there was no provincial building code, but municipalities had the power to pass building by-laws pursuant to power granted to them under *The Municipal Act*. Therefore, if building construction was regulated, it was regulated primarily at the municipal level pursuant to municipal building by-laws.

On March 14, 1968, by a Private Members Notice of Motion, the Member for Halton East, J.W. Snow, raised the necessity for a uniform building code for the entire Province in the following resolution:

> "That the government of Ontario should adopt the national building code, standardizing building, fire and safety legislation, and that this code should be made applicable to all residential, commercial and industrial buildings in all municipalities of this province."[1]

In response to this resolution, the Minister of Municipal Affairs, Darcy McKeough, in May 1968, indicated his intention to establish a committee to examine, comment and report to the government about uniform building standards. On September 12, 1968, the committee was established. Its report as to the feasibility of uniform building standards, commonly known as the Carruthers Report, was delivered to the government in November of 1969 (Exhibit 122).

When writing its report, the Carruthers Committee recognized that the NBC had been adopted by many municipalities or had formed the basis of their building by-laws.[2] There was, however, no compulsion for any municipality to use the National Building Code. After reviewing the divergence of municipal building by-laws from one municipality to another, the Committee recommended that the Province have a mandatory uniform code for building based on the National Building Code. The Committee further recommended that a uniform fire code based on the NFC should also be mandatory throughout the Province.[3]

When it made its recommendation for a uniform building code and a uniform fire code for the Province, the Carruthers Committee recognized that in order to have a truly uniform code, all municipal by-laws and any other provincial regulation of building construction and fire safety standards for buildings would have to be eliminated. In relation to this concern, the Committee recommended:

> "That the present acts, regulations, department policies and any other conflicting private act or municipal by-law, insofar as they deal with building, be repealed or revoked and replaced with the National — Ontario Building Code and the National — Ontario Fire Code at the time those codes come into force and, after coming into force, that no additions, deletions or amendments dealing with building be made except through the medium of those codes."[4]

The process described in this quotation has been referred to by witnesses before this Inquiry as "consolidation of legislation".

As a result of the Carruthers Report, a Building Code Branch was established within the Department of Labour in 1970. Mr. Graham Adams was appointed its Director.

Upon Mr. Adams appointment, a review of the National Building Code was undertaken, with a view to the preparation of an Ontario Building Code which would follow the NBC as closely as possible. In 1973, draft regulations, which subsequently became the OBC, were tabled. During the period of development of the BCA and the OBC, the Building Code Branch was transferred from the Ministry of Labour to the Technical Standards Division of the Ministry of Consumer and Commercial Relations.[5] The BCA itself was assented to in 1974 and was subsequently proclaimed on the 31st day of December, 1975. Regulations (the OBC) came into force on the same date.

In the last five years, there have been nine major amendments to the Ontario Building Code. Two of those changes can be considered of particular importance to this Inquiry. They deal with single station smoke detectors in apartment suites,[6] and provisions for the handicapped.[7]

In 1981, an extensive review of the BCA and OBC was commenced by the Building Code Branch and amendments have been proposed (Exhibit 130). The main purposes of the proposed amendments are to create more uniformity between the OBC and the NBC, and to update the references to technical standards in the OBC which are now outdated or non-existent.

All of the provincial building code directors are members of an organization known as the Provincial Advisory Committee to the Associate Committee on the National Building Code. The creation of more uniformity between building codes used in the provinces and the NBC is a goal of that Committee. If this goal is achieved, all provincial building codes would be identical and there would, in effect, be one building code used across Canada.

The Province of Ontario has not acted as promptly as one would expect in order to achieve these goals. The recent comprehensive review of the OBC is the first of its kind since enactment of the OBC on December 31, 1975. In my view, the failure to establish a regular revision of the OBC has resulted in a lack of uniformity between the NBC and the OBC, and has resulted in a code which, in many respects, is outdated.

It is for the above reasons that I make the following two recommendations:

Recommendation:

2.1 The Ontario Building Code should be republished every five years to match the National Building Code publication cycle.

Recommendation:

2.2 The Province of Ontario should adopt the proposed amendments to the Ontario Building Code (Exhibit 130) expeditiously with the few exceptions referred to herein.*

In January, 1983, the Inquiry was advised by Mr. Graham Adams, the Director of the Building Code Branch at that time, that the proposed amendments (Exhibit 130) were finalized and were ready for review by his superiors. Before this review took place, the Building Code Branch was transferred to the Ministry of Municipal Affairs and Housing, and Mr. Adams ceased to be its Director.

The new Director of the Building Code Branch is Mr. David Hodgson. He assured the Inquiry of his intention to present the proposed amendments to the regulations committee forthwith. In response to my question as to how quickly the regulation would become effective, he answered:

> "Probably the end of September [1983]."[8]

Mr. Hodgson's knowledge of government policy on a number of issues was somewhat limited, undoubtedly a condition arising from his recent appointment. Mr. Adams advised the Inquiry of his memoranda and efforts to acquaint the new Director of the many issues being considered by the Building Code Branch.[9]

One of the matters that Mr. Hodgson will have to consider is the proposed Renovation Code. The OBC applies whenever someone undertakes the work of building construction. "Construct" is a defined term in the BCA:

> Section 1(1)(e): "Construct" means to do anything in the erection, installation or extension or material alteration or repair of a building and includes the installation of a building unit fabricated or moved from elsewhere, and "construction" has a corresponding meaning.

Although it can be difficult to determine when certain work can be considered a "material alteration or repair", certainly a major renovation of an existing building falls within the above definition of construction.

The OBC sets standards to be complied with when doing the work of construction, but those regulations are really designed for use in new construction. There are many situations when the standards in the OBC are difficult or impossible to apply when renovating existing buildings. For example, it may be impossible to comply with a requirement for fire resistance ratings for roof assemblies, because the building being renovated will presumably already have a roof.

The application of the standards set out in the OBC in situations where a person is doing voluntary renovation has caused some confusion. In practice, building officials have tended to exercise a good deal of discretion in these situations, although that discretion is not actually provided for in the legislation. In some cases, it has been necessary for the owner to go to the Building Code Commission with the support of the building official simply to get plan approval.

Mr. Graham Adams testified that a tri-ministry study involving the Ministry of Consumer and Commercial Relations, the Solicitor General, and the Ministry of Municipal Affairs and Housing has been undertaken for the purpose of designing a Renovation Code for inclusion in the Ontario Building Code. The early draft of that code has been circulated for comment, and the draft is generally referred to as the "Part 11 Renovation Code". The purpose of this proposed portion of the OBC is to set minimum standards for renovation if existing OBC requirements are impractical or uneconomical in the circumstances.

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*The amendments to the OBC were filed with the Regulations Committee on September 16, 1983 as Regulation 583/83.

When giving his evidence early in 1983, Mr. Adams suggested that the Renovation Code would be part of the OBC by the end of the year. This timetable may be affected by the transfer of responsibility for the Building Code to the Ministry of Municipal Affairs and Housing. There must be considerable interaction between the Building Code Branch and the Office of the Fire Marshal in the process of designing the Renovation Code because it is undesirable for there to be any conflicts between that Code and the retrofit requirements being drafted for Part 9 of the Ontario Fire Code.

Since the enactment of the OBC, the Government of Ontario has commissioned two studies of the OBC or parts thereof, which were relevant to the Inquiry's terms of reference. In 1976, the Province requested Fodor Engineering Ltd. to perform a cost benefit analysis of Subsection 3.2.6 of the NBC for the Building Code Branch of the Ministry of Consumer and Commercial Relations.[10] This report was received by the Ministry in March of 1977. The authors of that report stated that the purpose of the report was:

> "To provide a basis for decisions as to which provisions would be included in the Ontario Building Code to ensure proper life safety in high apartment buildings."[11]

A further study was conducted for the Building Code Branch by Dunlop Farrow Aitken (Architects and Engineers) in 1982.[12] The authors were requested to study the building requirements of Subsection 3.2.6. of the 1980 edition of the NBC with reference to the methods suggested therein to limit exposure to smoke, with particular reference to the ACNBC Booklet, "Measures for Fire Safety in High Buildings, 1980". It was their responsibility to suggest which Smoke Control Measures, if any, should be adopted for business, personal service, mercantile and hotel occupancies in Ontario.

Ontario Fire Code:

The purpose of the OFC is:

> "to regulate buildings from the day of completion of construction to the day of completion of demolition with respect to the fire matters by establishing:
>
> (a) standards for fire prevention,
> (b) fire fighting and life safety in buildings,
> (c) including but not limited to retrofitting of existing buildings and in relationship to change of occupancy,
> (d) standards for the conduct of activities causing fire hazards,
> (e) maintenance of fire safety equipment and egress facilities,
> (f) standards for portable extinguishers,
> (g) limitations on building contents,
> (h) the establishment of fire safety plans including the organization of supervisory staff for emergency purposes, and

(i) establish the standard for fire prevention, containment and fighting of fires originating outside buildings which may present a hazard to a community."[13]

In 1969, the Carruthers Committee recommended a uniform fire code as well as a uniform building code. The Government proceeded with the building code, but it was not until November, 1981, some twelve years later, that an Ontario Fire Code came into force.

A questionnaire regarding municipal fire safety by-laws was distributed to a number of fire departments by the Office of the Fire Marshal in late 1978 and early 1979. Forty-five fire departments responded. Twenty-one departments reported that they used municipal by-laws based on the 1963 NFC; 21 departments used a by-law based on the 1975 NFC; and three fire departments used a by-law based on the 1977 National Fire Code. These responses clearly illustrated a need for a uniform fire code for the Province (Exhibit 35).

I do not know why action on the recommendation regarding a provincial fire code was delayed, but it is obvious that no meaningful steps were taken to address the issue until an Advisory Committee was established to consider a uniform code for the Province of Ontario in November, 1976. The OFC was finally developed under the guidance of the Ministry of Consumer and Commercial Relations, the same Ministry which until recently, administered the Ontario Building Code.

The Advisory Committee report reiterated the desirability of a uniform fire code and consolidation of fire safety standards for buildings which had been discussed by the Carruthers Committee in 1969. The Advisory Committee stated:

> "It is intended that all provincial fire safety regulations in respect of property and of buildings from the day of completion of their construction to the day of completion of demolition be in the Ontario Fire Code and that all provincial acts and regulations in conflict with the Ontario Fire Code legislation and the Ontario Fire Code be amended or deleted to eliminate this conflict."[14]

During the hearings held by the Standing Committee on the Administration of Justice relating to the OFC, submissions were received from many interested groups. Some representatives of the fire service recognized the desirability of a provincial fire code, but wanted the municipalities to retain the right to impose higher standards than the Ontario Fire Code.[15] A few submissions to that effect were received by this Inquiry.[16]

As I interpret those submissions, there were three reasons for advocating that municipalities retain this power. First, the OBC and OFC are not amended frequently enough to properly react to problems encountered on a daily basis by building and fire officials. Second, in some cases, codes do not impose a standard which is at a level suitable to the concerns of the municipality. Third, until retrofit legislation is imposed for all highrise buildings under the OFC, the municipalities desire the power to pass by-laws providing for necessary upgrading of highrise buildings.

In the final analysis, the government prohibited any municipal by-laws relating to fire safety standards for buildings in order to ensure uniformity across the province.[17] I heartily endorse this decision.

Recommendation:

2.3 The Ontario Fire Code should be republished every five years to match the National Fire Code publication cycle.

The OFC is relatively new legislation in Ontario. This recommendation is designed to avoid the problem of lack of review which has been experienced with the Ontario Building Code.

Hotel Fire Safety Act

The third major Act governing fire safety in Ontario is the *Hotel Fire Safety Act* (HFSA). This Act has been in existence in varying forms since 1888. Without substantial alteration, the Act has been in its present form since 1971.[18]

The HFSA contains provisions regarding both the construction of hotels and their maintenance once built. It also imposes retrofit requirements upon hotels which do not meet the standards prescribed by the Act.

The HFSA is administered by the OFM mainly through the Hotel Fire Safety Services Unit (HFSSU). Proposed amendments to the HFSA/Regulations have been drafted, and were reviewed in detail by the Inquiry.[19] Mr. John Hess, Chief of the HFSSU, testified that those amendments should come into effect by the fall of 1983. The four main purposes of the proposed amendments are: to make the maintenance provisions of the HFSA Regulation consistent with the OFC; with a few exceptions, to eliminate the conflicts between provisions of the OBC and the HFSA regarding construction by making the OBC the applicable legislation; to impose some additional retrofit requirements on hotels; and to deal with problems which have been identified since the 1971 amendments to the *Hotel Fire Safety Act*.[20]

As I have devoted Chapter 4 of this report to hotels, a more detailed discussion of the HFSA, the proposed amendments, and the work of the Hotel Fire Safety Services Unit are contained in that Chapter. As a general observation, the Hotel Fire Safety Services Unit of the Office of the Fire Marshal has, in addition to preparing amendments to the HFSA, been performing a commendable job of organizing the training of hotel inspectors and hotel staff within Ontario, and preparing fire safety literature for hotel guests. I was most favourably impressed with those efforts, and particularly the work of Mr. John Hess.

This completes my general review of the three major Acts dealing with fire safety in Ontario. At the risk of oversimplification, the purpose of the three Acts can be summarized in this way:

BCA/OBC — governs the construction and alteration of the four types of highrise buildings discussed in this report.

FMA/OFC — governs fire safety within buildings after construction by imposing fire safety standards dealing with the maintenance of the building, and requires fire safety plans which provide for maintenance and emergency procedures.

HFSA/Reg — *at the present time*, governs some construction aspects of hotels, and imposes fire safety standards in all existing hotels.

CONSOLIDATION OF LEGISLATION

Recommendation:

2.4 The government of Ontario should expeditiously complete the task of consolidating all legislation respecting the construction or demolition of buildings into the Ontario Building Code, and all legislation respecting fire safety standards for buildings and other structures and premises into the Ontario Fire Code.

The Carruthers Committee made the following recommendation:

> "That the present acts, regulations, department policies and any other conflicting private act or municipal by-law, insofar as they deal with building, be repealed or revoked and replaced with the National — Ontario Building Code and the National — Ontario Fire Code at the time those codes come into force and, after coming into force, that no additions, deletions or amendments dealing with building be made except through the medium of those codes."[21]

Upon enactment of the OFC in November of 1981, there existed two "companion documents" which together regulated both the construction of buildings (OBC) and fire safety standards for existing buildings (OFC). The BCA provides that all municipal building by-laws respecting construction and demolition of buildings be superseded.[22] The FMA has a similar provision respecting all municipal by-laws with regard to fire safety standards for buildings and other structures and premises.[23] This does not, however, constitute implementation of the recommendation of the Carruthers Committee that there be "consolidation of legislation".

A cursory review of the Statutes of the Province of Ontario indicates that the Province has done little to consolidate its legislation as recommended by the Carruthers Report. In fact, the evidence indicated that forty-two separate Provincial Acts and their Regulations still contain various provisions respecting building construction or fire safety standards for buildings.[24]

The transfer of the Building Code Branch from the Ministry of Consumer and Commercial Relations to the Ministry of Municipal Affairs and Housing referred to earlier, was announced to the legislature by the Honourable Norman W. Sterling, Provincial Secretary for Justice on January 27, 1983, and was effective as of February 1st, 1983. In his statement, Mr. Sterling touched on the issue of consolidation. He said:

> "Except for measures relating to fire safety, this transfer will consolidate all regulations and legislation presently dealing with the construction, renovation and rehabilitation of buildings in Ontario."

He also made the following statement:

> "I am confident that the transfer of the responsibility for the Building Code will contribute greatly to reducing any overlap among Provincial Acts relating to buildings."[25]

I am uncertain whether this statement is meant to extend to the removal of building matters from all of the statutes by the simple device of making the OBC the applicable building legislation in all cases. It certainly indicated the *administration* of the Building Code and all other regulations and legislation dealing with building construction would be consolidated within one Ministry. Mr. Sterling did not say directly that consolidation of legislation as recommended by the Carruthers Committee would occur. It is this latter type of consolidation which, in my view, is of prime importance.

The recommendation of the Carruthers Committee will be fourteen years old in November 1983. If the goal is to remove from all legislation, other than the OBC and OFC, those provisions which deal with construction of buildings and fire safety standards, surely now is the time to conclude this particular task. The evidence given by government officials clearly indicated that there was no objection to such a process.

The existence of multiple legislative directives with regard to building construction is wasteful, creates contradiction and confusion and results in conflict over jurisdiction. In my opinion, the failure of the Province to attend to what appears to be a simple and straightforward matter is, to say the least, disappointing in the extreme.

It should be noted that consolidation of *all* Provincial legislation into the OBC or OFC is not desirable. There are a few reasonable exceptions to the general goal of consolidation. An example is the *Elevating Devices Act* which, due to the unique expertise of the people it regulates and the small size of the elevator industry, is probably best left as a separate Act. Any conflicts between that Act and the OBC or OFC should, of course, be resolved. The conflicts raised during the Inquiry are dealt with in detail in Chapter 8.

Contemporaneously with, but quite independent of the development of the OFC, the National Research Council was considering fire prevention and control systems throughout Canada. A study was undertaken in response to a brief from the Association of Canadian Fire Marshals and Fire Commissioners and the Canadian Association of Fire Chiefs. This report entitled "Study on Fire Prevention and Control Systems in Canada", came to the same conclusions as the Carruthers Committee some 12 years earlier by identifying the proliferation of laws and regulations and enforcement agencies involved in fire protection areas as a problem to be overcome. The following recommendation of that report deals indirectly with this issue:

> "The Provinces and Territories should carry out a review of the distribution of authority for enforcing regulations, to promote the enactment of adequate fire prevention in building codes and provide coordination of fire safety enforcement under the control of the Fire Marshal or Commissioner."[26]

Some witnesses testified that until the two companion Codes (OBC and OFC) are administered by one Ministry, true consolidation will not have taken place. This was a recommendation of the Carruthers Report. It was also a recommendation made by the Coroner's Jury that examined the fatality in the apartment fire at 88 Bloor Street East. Their recommendation was forwarded by the Chief Coroner, Dr. Ross Bennett, to the Ministry of Consumer and Commercial Relations, and reads as follows:

> "That the current multiplicity of fire prevention legislation be brought under one Provincial Ministry."[27]

Mr. Yoneyama, Executive Director, Technical Standards Division of that Ministry, replied to Dr. Bennett:

> "Comment: Proposals for putting legislation pertaining to the design, construction, maintenance and upgrading of buildings under the administration of one ministry have been made

> previously. In 1969 the Committee on Uniform Building Standards for Ontario recommended that a variety of pieces of legislation dealing with building construction and design be administered by one ministry.
>
> Recently, a study commissioned by the Ontario Association of Property Standards Officers to examine the enforcement of property standards relative to enforcement of the Building Code and fire prevention concludes that legislation governing Building and Fire Codes and local municipal property standards by-laws be administered by one ministry. A similar recommendation was made in a motion passed by the Ontario Building Officials Association. This motion was forwarded to the Office of the Premier and is currently under consideration."[28.]

The most important goal to be achieved respecting consolidation is to consolidate all legislation respecting construction of buildings and fire safety standards for buildings into the OBC and OFC, respectively.

I do not perceive any need to have the two Codes administered by one Ministry at this time. There is, in my opinion, good reason for the Office of the Fire Marshal to remain within the Public Safety Division of the Ministry of the Solicitor General. This Division deals with the coordination of fire safety services as well as the methods of minimizing or eliminating hazards to persons or property, and includes scientific investigations and the coroner's system. A major aspect of the work of the Office of the Fire Marshal has traditionally been to investigate events that are threatening to public safety. This process requires an approach that combines technical expertise with police work. The information gained through this process has been applied by the Fire Marshal to improve fire safety.

One last issue relating to both the OBC and the OFC is whether those two Codes should be consolidated. For the reasons expressed by Roy Philippe, I do not believe they should be consolidated. He testified:

> "They are two different documents and they are normally used by two different groups. . .the National Building and Fire Codes operate independently under two separate associate committees, there is liaison, obviously. . .the people who are responsible for building are not necessarily responsible for the ongoing operation. The two documents therefore are not necessarily of value if they are combined, because they are being used by two different user-type groups. And it's the same thing with the people who were actually legislated by it. . .one person may build it for someone else. . .I can see limited value in consolidation. . .it puts a lot of information in one document that one group or another might not use."[29]

MUNICIPAL PROPERTY STANDARDS/ OCCUPANCY BY-LAWS: RETROFIT IMPLICATIONS

Recommendation:

2.5 Retrofitting of existing buildings for life and fire safety should be governed by provincial legislation only.

The *Planning Act* and the *Municipal Act* give municipalities the power to control various matters which are local and particular to that municipality by the passage of by-laws. Those by-laws may conflict with or establish a different standard than provincial legislation.

As discussed, the BCA and FMA provide that all municipal by-laws regarding construction of buildings and fire safety standards in existing buildings are superseded. Notwithstanding these provisions, two issues regarding municipal by-laws arose during the Inquiry.

First, are municipal by-laws imposing *retrofit* requirements relating to fire safety superseded? When the OFC came into force, a letter from the Honourable R. Roy McMurtry, then Solicitor General, advised users of the OFC that notwithstanding the wording of Section 18a (4) of the *Fire Marshals Act*, retrofit by-laws would remain unaffected until Part 9 of the OFC contains retrofit provisions to deal with the occupancies which are the subject matter of those by-laws.

If Mr. McMurtry's legal opinion is correct, I foresee considerable difficulties. For example, the City of Ottawa has passed a by-law requiring all residential buildings in excess of three storeys to be retrofitted with smoke alarms. When the OFC contains retrofit requirements for those buildings, smoke detectors may not be required or a different standard for smoke detectors may be imposed.

The imposition of a different retrofit standard by the OFC in comparison to any municipal retrofit by-law could have an adverse financial impact on building owners who have undertaken work in order to comply with the municipal retrofit by-law. For example, this would occur if an owner had installed a smoke detector in compliance with the Ottawa by-law, and shortly thereafter was faced with an OFC retrofit provision which required a different type of smoke detector.

If the OFC retrofit provision imposed a higher standard than a local retrofit by-law, one method of avoiding the adverse financial impact on a building owner would be to exempt certain buildings from the OFC retrofit requirement. Exemptions could be granted for those buildings which had complied with the municipal by-law within a defined period of time prior to the enactment of the OFC provisions. Legislative provisions of this nature are called "grandfather clauses". In my view, a "grandfather clause" is not desirable because it would result in a lack of provincial uniformity respecting the particular matter for which a retrofit standard had been defined by the Ontario Fire Code.

The dilemma that I have described highlights the need for Part 9 of the OFC to be completed in relation to all occupancies with dispatch.

Second, municipalities pass property standards/occupancy by-laws which have an aspect of fire safety. The issue that arises is whether those by-laws are directed primarily to matters other than fire safety, such as the abatement of nuisances, and are therefore not superseded. For example, is a by-law prohibiting barbecuing on balconies a by-law respecting fire safety and therefore superseded by the OFC, or is it a by-law directed towards preventing the nuisance of smoke? In my view, this type of issue will have to be resolved based on the interpretation of each individual by-law.

Section 18 of the *Fire Marshals Act* deals with inspections of buildings and premises. It states:

> 18.-(1) Subject to the regulations, the Fire Marshal, Deputy Fire Marshal, a district deputy fire marshal, an inspector or an assistant to the Fire Marshal may, upon the complaint of a person interested, or when he considers it necessary so to do, without such complaint, inspect all buildings and premises

within his jurisdiction, and for such purpose may at all reasonable hours enter into and upon the buildings and premises for the purpose of examination, taking with him, if necessary, a constable or other police officer or such other assistants as he considers proper.

(2) If, upon such inspection, it is found that a building or other structure is for want of proper repair or by reason of age and dilapidated condition or any other cause especially liable to fire, or is so situated as to endanger other buildings or property, or so occupied that fire would endanger persons or property therein or that exits from the building or buildings are inadequate or improperly used, or that there are in or upon the buildings or premises combustible or explosive materials or conditions dangerous to the safety of the buildings or premises or to adjoining property, the officer making the inspection may order,

(a) the removal of the buildings or the making of structural repairs or alterations therein;
(b) the removal of combustible or explosive material, or the removal of anything that may constitute a fire menace;
(c) the installation of safeguards by way of fire extinguishers, fire alarms and other devices and equipment and also such avenues of egress, fire escapes and exit doors as are considered necessary to afford ample exit facilities in the event of fire or an alarm of fire.

Recommendation:

2.6 Until Part 9 of the Ontario Fire Code, which will contain the retrofit regulations, is in effect, Section 18(2) of the* Fire Marshals Act *should be used to order necessary fire and life safety installations by way of retrofit.

Recommendation:

2.7 Upon the enactment of Part 9 of the Ontario Fire Code, Section 18(2) of the* Fire Marshals Act *should be amended to restrict its use to emergency situations only.

The major issue arising from the discussion of Section 18(2) of the *Fire Marshals Act* was the scope of the inspectors authority to order retrofit.

The City of Toronto has been reluctant to employ Section 18(2) to require retrofitting because of difficulties encountered with the Office of the Fire Marshal prior to Mr. Bateman's appointment. Apparently, on an appeal made to him under Section 18, a former Fire Marshal did not support a retrofit order made by the City of Toronto Fire Department.

On the other hand, the Inquiry was advised that the City of North York has successfully used Section 18(2) for retrofit orders for many years. Roy Philippe advised the Inquiry that it is his view that Section 18 is clearly intended to provide a mechanism to make orders which require the upgrading of existing buildings for the purpose of life safety from fire. The evidence of some witnesses and the submission of Mr. Jaffary suggested that section 18(2), even at present, only allows for orders in emergency cases.

Since the hearings ended, I learned that Section 18(2) of the *Fire Marshals Act* may be the subject of a judicial review which will bear directly on this issue.

As discussed above, there was serious complaint about possible confusion and economic hardship for building owners arising from conflicts between municipal by-laws ordering retrofit and new retrofit standards to be imposed under the Ontario Fire Code. If municipal fire departments have the discretion to order retrofit under Section 18(2) of the FMA, the same conflicts could arise between those orders and new retrofit standards in the Ontario Fire Code.

Strictly speaking, in order to be consistent with my view that no by-law should deal with building or fire matters and that the proper way to deal with such requirements is by codified and uniform regulations, I should make the same comment about the discretion which exists in Section 18(2) of the *Fire Marshals Act*.

I am hesitant to make that statement for one reason. Quite frankly, I was shocked to learn that there are old highrise buildings in the City of Toronto that do not have a fire alarm system at all. I have no reason to believe that this is not the case in other major cities in the Province.

The preparation of the retrofit provisions for inclusion in the OFC is proceeding on an occupancy by occupancy basis. I am confident that the regulations for each occupancy will include a requirement for a fire alarm system, and I have recommended such a provision in Chapter 8. Not only is such an installation the most elementary life safety system needed, it is almost impossible to have a usable fire safety plan without having a fire alarm. While the practicalities of drafting a complete retrofit code may result in some delay in introducing certain sections of Part 9, I consider the lack of a fire alarm system, a basic element of life safety, to be serious enough that it must be rectified immediately. It appears to me that Section 18(2) would allow the fire departments to do this by making appropriate orders.

Once any particular occupancy has been dealt with in Part 9, however, I do not believe the fire departments should continue to have discretionary power to order retrofit. I understand that, with the introduction of Part 9 of the OFC, Section 18(2) will be amended by adding the following:

> 2.-(1) Subsection 18(2) of the said Act is amended by inserting after "property" in the tenth line "or that a provision of the fire code is being contravened" and by adding thereto the following clauses:
>
> (d) with the approval of the Fire Marshal and on such terms and conditions as the Fire Marshal considers proper, the closing of the buildings, other structures or premises until such time as corrective action has been taken and the hazardous condition has been rectified; and
>
> (e) the remedying of any contravention of the fire code.

When those Sections become law, the inspector under Section 18(2)(e) will clearly have the power to order compliance with retrofit requirements in Part 9 of the Ontario Fire Code.

As an additional matter, I am uncertain whether the new Section 18(2)(d) will provide sufficient authority to deal with emergency situations. For instance, there could be a situation where a fire in a portion of a building has rendered life safety systems inoperative. This could result in the need for an order to replace or repair the system before the building could be used. If this situation can be corrected by the use of Section 18(2)(d), then there appears to be no further need to retain the discretion in Section 18(2)(c). If such an emergency cannot be dealt with under Section 18(2)(d), then some residual discretionary power must be left with the fire department to order immediate rectification.

Orders made in such emergency situations should not, in any case, require an owner to exceed the retrofit provisions of the Ontario Fire Code. Amendments to Sections 18(2)(a)(b) and (c) may be required in order to ensure that this limitation is made clear. Further amendments may be necessary to limit the application of the section to emergency situations. One way or another, in such an emergency, the capacity to order immediate correction is essential.

Finally, I restate the comment that provisions for retrofit of all occupancies must be added to Part 9 of the OFC as soon as possible.

INSPECTIONS

Presently, there is a multiplicity of fire safety inspections of highrise buildings due to the many Provincial laws administered by different Ministries which contain provisions relating to fire safety. This was the subject of complaint by building owners because contradictory orders relating to the same matters were being issued by different inspectors. My recommendation to consolidate all fire safety legislation into the OBC or OFC (Recommendation 2.4) is directed to this problem.

Recommendation:

2.8 Increased funding should be provided to ensure proper inspection by Ontario Building Code and Ontario Fire Code inspectors of all highrise buildings.

During the Inquiry, the evidence demonstrated that fire safety requirements were not being enforced strictly enough and that penalties for breaches of such requirements were inadequate, notwithstanding some recent substantial penalties imposed under the Ontario Fire Code.[30]

Many witnesses, including representatives of the fire service, attributed the lack of enforcement to a shortage of funding which restricted the size of public inspection agencies. It is my perception that this problem is especially acute for the fire departments as they do not receive their funds on a Provincial basis, but from the general funds of the municipality.

It is very easy for the municipalities to complain about fire laws which are ineffective, but as this report will stress, the "check, inspect and test" provisions of the OFC and compliance with provisions of the OBC are a most essential part of complete fire safety. For these reasons, it is my recommendation that serious consideration be given to increasing the funds provided to inspection agencies which enforce these Codes.

For comparison purposes, it is interesting to note the California approach to the enforcement of fire safety codes with respect to highrise buildings. In that State, the municipality is required to inspect all highrise buildings at least once a year. If the municipality does not perform the inspection, State inspectors do the inspection. In either case, the cost of the inspection is charged to the building owner.[31] Assistant Deputy Chief Sproule of the Toronto Fire Department did not believe that the imposition of a minimum frequency of public inspections was practical for highrise buildings in Ontario.[32]

It is my hope that the increased funding recommended will improve the frequency of inspections by public agencies and thereby provide improved life safety in highrise buildings.

A further discussion of the role of the Fire Service in fire prevention inspections is found in Chapter 12.

Section 10 of the BCA is the basis upon which building officials enter buildings and take enforcement action when they deem it necessary.

Recommendation:

2.9 The* Building Code Act *should be amended so that the inspector's power under Section 10 is clearly restricted to unsafe conditions of a structural nature, and that orders may be made in relation to vacant buildings and to all buildings regardless of their date of construction.

Section 10 of the BCA states:

> 10.-(1) Subject to section 11, an inspector may enter in or upon any land or premises at any time without a warrant for the purpose of inspecting any building to determine whether such building is unsafe.
>
> (2) Where an inspector finds that a building is unsafe, he may serve upon the assessed owner and each person apparently in possession of the building an order in writing setting out the reasons why the building is unsafe and the remedial steps that the inspector requires to be taken to render the building safe and may require the order to be carried out within such time as the inspector specifies in the order.
>
> (3) Where an order of an inspector under subsection (2) is not complied with within the time specified therein, or where no time is specified, within a reasonable time in the circumstances, the chief official may by order prohibit the use or occupancy of the building and such order shall be served on the assessed owner and each person apparently in possession and such other persons affected thereby as the chief official specifies and a copy thereof shall be posted on the building, and no person except an inspector or the chief official shall remove such copy unless authorized by an inspector or the chief official.
>
> (4) Where the chief official has made an order under subsection (2) and considers it necessary for the safety of the public, he may cause the building to be renovated, repaired or demolished for the purpose of removing the unsafe condition or take such other action as he considers necessary for the protection of the public and, where the building is in a municipality, the cost of the renovation, repair, demolition or other action may be added by the clerk to the collector's roll and collected in like manner as municipal taxes.

The evidence suggested that the scope of Section 10 of the BCA is unclear. To have doubt about such a basic provision is highly undesirable. Three issues arose in relation to this Section.

1. Does "unsafe" include a situation where the reason for the unsafe condition is related to fire safety, but is not a structural defect?
2. Does Section 10 apply to vacant buildings?
3. Does Section 10 apply to buildings constructed prior to 1976?

The confusion over what the term "unsafe" meant was apparent upon reviewing the interpretation given to it by various witnesses. For instance, Rashmi

Nathwani, Deputy Chief Building Official of the City of Toronto, testified that most of the Section 10 orders that he is aware of deal with fire escapes. In his opinion, an "unsafe" condition can be a fire safety matter.

George Fleming, the Chief Building Official for the City of Scarborough, testified that Section 10 could not be used to order retrofit of fire safety matters unless purely a structural matter.

Lyle MacLennan, Chief of the Ottawa Fire Department, testified that the Chief Building Official in Ottawa does not believe that Section 10 contemplates orders being made which relate to fire safety matters, but that it applies to structural safety of buildings only.

Graham Adams, the former Director of the Building Code Branch, testified that Section 10 is an emergency power only. He was equivocal in his evidence as to whether it contemplated orders relating to fire safety which were not structural in nature.

The practical problem which arises if the term "unsafe" is not clarified is that many building officials are hesitant to make orders under Section 10 where the unsafe condition is a fire safety matter but is not structural in nature. There is a practical solution to this problem. It is a solution that has already been used even though it is not formally recognized. There exists and should continue to exist a protocol between the OFC and OBC inspectors. If the OBC inspector finds unsafe conditions which fall into the OFC jurisdiction, this condition should be reported to the OFC inspector and vice versa.

The doubt regarding whether Section 10 applies to vacant buildings arises from the definition of "unsafe" which includes buildings which are:

> "...in a condition which could be hazardous to persons in the *normal use* of the building."

Those who wish to avoid orders pursuant to Section 10 argue that a vacant building is not in use, and therefore the Section does not apply. In my view, Section 10 should apply to vacant buildings, and if it is necessary for the enforcing authorities to have this matter clarified, this Section should be amended accordingly.

In relation to the third issue, it is my view that Section 10 does apply to buildings constructed before 1976, and the Section should be enforced accordingly.

Recommendation:

2.10 All interior finish products installed in a building which are required to have a flame-spread rating or a smoke developed classification should bear an identifying mark or symbol confirming that the product has the required rating or classification.

There is no requirement that all interior finish products installed in a building bear a stamp or label which warrants the products comply with required ratings or classifications. For example, broadloom is required to have a flame-spread rating. The building inspector must rely on assurances given by the contractor or manufacturer that the broadloom meets the flame-spread rating or smoke developed classification.

There was no evidence that lack of a label has contributed to the fire loss record. There was evidence, however, that lack of a label or stamp has caused inconvenience and concern amongst some building inspectors. Mr. Adams, the former Director of the Building Code Branch, candidly admitted that he did not know how serious a problem this was, but the issue has been brought to the attention of the Building Code Branch on a number of occasions.

It would seem that the use of a label, stamp or identifying mark would be a way of solving this particular problem for products such as wallpaper, broadloom and other interior finish products. The cost-effectiveness of this recommendation should be considered before implementation.

Enforcement:

Recommendation:

2.11 The Ontario Fire Code should be more actively enforced, and the courts should impose substantially increased penalties for breaches of the Ontario Fire Code, and upon convictions for* Criminal Code *offences involving fire safety matters.

On my view of the evidence, there is a reluctance by the fire service at large to enforce the OFC, particularly the provisions which require the preparation of a fire safety plan.[33]

The OFC only became effective in November of 1981. Initially, there was confusion as to what precisely was required by the OFC, particularly as to fire safety plans. The response to a questionnaire prepared by Commission Staff and distributed to Chief Fire Officials across the Province, indicated that the level of compliance with Section 2.8 of the OFC is very poor.[34]

The evidence shows that the owners of highrise commercial buildings are generally aware of the requirements of the Ontario Fire Code. Guidelines for the preparation of fire safety plans for residential buildings have been produced and are available to building owners. Institutions have the staff, the experience, and the assistance of the Fire Marshal's Office in order to comply with the Ontario Fire Code.

Assistant Deputy Chief Sproule of the Toronto Fire Department testified that "the Fire code is probably the most effective tool the fire service in Ontario has ever had to attempt to assure fire safety in buildings."[35] He used the apartment fire at 800 Richmond Street (described in Chapter 3) as an example. Prior to the enactment of the OFC, he believes he might have been able to lay one charge with a maximum fine of $25.00. Prosecution pursuant to the OFC resulted in fines of $12,000.00. This case and evidence of some other fines which have been imposed for breaches of the OFC were encouraging.[36] An analysis of the fines being imposed leads me to conclude, however, that the fines are generally on the low side of the scale. I believe increased fines will act as a greater deterrent to others, and I can see no reason not to lay charges for any failure to follow the OFC from this time forward.

The *Criminal Code* also contains offences related to fire matters. They include causing death by criminal negligence (Section 203), arson (section 389), setting a fire by negligence (section 392), causing "other fires" (section 390), and false alarm of fire (section 393).

Chapter 8 contains a discussion of the serious problem of false alarms, and I have recommended the imposition of substantial penalties including restitution orders for the costs of the fire department's unnecessary response.[37]

Arson is an increasing problem. John Bateman testified that the Investigation Section of the OFM is unable to respond to all the requests for arson investigations.

Arson also has a significant effect on life safety.

> "Incendiarism as a cause of fatal hotel fires increases as the number of fatalities increases. For instance, in hotel fires where there are one or two fatalities, incendiary or suspicious fires account for only 11.03% of the total incidents. In fire with three or more fatalities 32.35% of the total are incendiary or suspicious. And in fires with five or more fatalities, 50% of the fires are incendiary or suspicious."[39]

In Nova Scotia, a criminal prosecution for criminal negligence causing death was initiated as a result of a fire in an apartment building. The accused was discharged with respect to all criminal negligence charges after a preliminary hearing but was committed for trial on a count of wilfully causing a fire contrary to Section 392 of the *Criminal Code*. At the time of writing this report, no information has been received regarding an appeal from the dismissal of the criminal negligence charges.

It is my view that during the sentencing stage, Crown Attorneys must marshall evidence which will clearly illustrate the serious threat to life safety arising from fires.

Recommendation:

2.12 Chief Fire Officials should be required to maintain a record of convictions and fines for breaches of the Ontario Fire Code, and should advise the media, and particularly relevant trade and industry publications, of such convictions and fines.

One of the purposes of sentencing is to deter others. Unfortunately, there is little, if any, public knowledge of the fines being imposed for breaches of the Ontario Fire Code.

Recommendation:

2.13 Section 24(4) of the* Building Code Act *should be amended to provide that the limitation period contained therein will run not from the time of the actual breach, but from the date the breach is discovered.

Section 24(1) & (4) of the *Building Code Act* read as follows:

> 24(1) Every person who,
> (a) knowingly furnishes false information in any application under this Act or in any statement or return required to be furnished under this Act or the regulations;
> (b) fails to comply with any order, direction or other requirement made under this Act; or
> (c) contravenes any provision of this Act or the regulations or of any by-law passed under the authority of this Act,
>
> and every director or officer of a corporation who knowingly concurs in such furnishing, failure or contravention is guilty of an offence and on conviction is liable to a fine of not more

than $2,000 or to imprisonment for a term of not more than one year, or to both.

(4) No proceeding under this section shall be commenced more than one year after the time when the subject-matter of the proceeding arose.

A number of witnesses were concerned that the one year limitation period in Section 24(4) of the BCA for the commencement of proceedings under Section 24(1) has been calculated from the day of the breach. They submitted that this is unreasonable, and the one year time limit should begin from the day the breach is discovered.

In my view, it is undesirable to allow someone to breach a term of the Building Code and escape prosecution merely because the breach was not discovered for a year.

CODE DEVELOPMENT

Recommendation:

2.14 There should be a Standing Advisory Committee on the Ontario Building Code.

The purpose of a standing advisory committee would be to advise the government of OBC changes it believes are desirable due to new technology, new standards, or problems identified by the building industry. It could also comment on changes to the Code which are proposed by government. The ultimate responsibility for actual code amendments must remain with government.

Although Mr. Graham Adams, former Director of the Building Code Branch, did not believe a standing advisory committee is necessary, this recommendation was urged by representatives of both design professions (architects and engineers) and representatives of building officials. They pointed to the lack of periodic review of the OBC and the failure to update references to technical standards. These two reasons, which I find valid, support this recommendation.

It should be noted that such a standing committee would not be a completely new development in Ontario. When the OBC was first drafted, a standing committee system was used, and such committees continued to exist for a number of years.[39]

The membership of this standing advisory committee should be chosen from a matrix that represents a fairly broad spectrum of the building construction industry and those who are regulated by the Ontario Building Code.

I agree with the view that although this standing advisory committee could set up its own task groups, formal technical committees would not have to be established in Ontario because technical work is constantly being done at the national level through the Associate Committee on the National Building Code.

Recommendation:

2.15 There should be user representation on code development committees where there is an appropriate organization that represents a cross-section of user opinion.

In certain areas of the Province, there are organizations which probably satisfy the criteria described in this recommendation. The Federation of Metro

Tenants Associations is such an organization. Mr. Dale Martin, Chairman of this tenant association, testified that tenant involvement in code development is desirable and his organization is willing to become involved.

Mr. Roy Philippe of the Office of the Fire Marshal advised the Inquiry that if the criteria described in this recommendation could be satisfied, tenant representation on code committees would be appropriate.[40]

Those who addressed the concerns of the handicapped also indicated a desire to be involved. Mr. Adams explained that, while he was the Director of the Building Code Branch, some efforts were made in that direction.

In my view, if the users of the buildings are willing to participate through representative organizations, they should be encouraged to do so.

BUILDING AND FIRE CODE COMMISSIONS

Recommendation:

2.16 The Building Code Commission and the Fire Code Commission should be separate bodies, but have some joint membership.

The proclamation of Section 18b of the *Fire Marshals Act* will create the Fire Code Commission. This Commission will hear appeals from Fire Marshals Orders.[41] The two Commissions should operate separately. As both Commissions will make rulings related to buildings, it is my view that to ensure consistency there should be joint membership. Joint membership would also permit the sharing of expertise and experience possessed by individual Commission members.

OTHER LEGISLATIVE ISSUES:

Almost on a daily basis during the Inquiry, issues were raised by various witnesses as to difficulties they perceived with the three major Acts and Regulations.

I do not propose to discuss each of these items. I will simply list certain of them with brief comments, where necessary, as a synopsis of this portion of the evidence for the use of those who may wish to consider future amendment and clarification of the three major Acts. Certain factual situations and discussion bearing indirectly on the items may be found in other portions of this report.

1. Ontario Building Code:

a) **Definition** — The words "listed, labelled, certified, or laboratory tested" are used inaccurately and redundantly in the opinion of Mr. Pearce, Vice-President and Chief Engineer of the Underwriters' Laboratories of Canada.

b) **Access for Firefighters** — Difficulties can arise if access for firefighters is not considered during the planning of a building.[43] It was suggested that the problems could be avoided if the provisions of OBC, OFC and NBC with regard to firefighter access were consistent.

c) **Voluntary Installations** — It is the opinion of the Building Code Branch that a system which is installed on a voluntary basis, that is to say one that is additional to the installations required by the OBC, need not be installed to the standard prescribed by the OBC for those installations.[44] Such an installation may not be an effective fire safety system.

d) **Fire Dampers** — Experience in the use of dampers to protect air recirculation systems from smoke has been disappointing for a number of reasons. They can fail to close in the presence of "cold smoke", can become warped or may otherwise fail to operate as intended. It was suggested that new technology should be developed to respond to the problem of smoke movement in HVAC Systems.[45]

2. Ontario Fire Code:

a) **Acceptance of Fire Safety Plans** — If there is a difference of opinion between a building owner and a Chief Fire Official as to the sufficiency of a fire safety plan, there is no avenue of appeal for the owner unless the Chief Fire Official makes an order for compliance with the OFC, pursuant to s. 18(2).

b) **Schematic Diagrams** — There was some confusion expressed by owners about how one would comply with Article 2.8.2.5, which requires a *record* to include *schematic diagrams of the fire emergency systems*. I note that the Guidelines for Preparation of Fire Safety Plans for Residential Buildings does not offer specific guidance as to the meaning of "schematic diagrams", nor does it give any information about what a "record" is.

3. Hotel Fire Safety Act:

Section 18a(4) of the *Fire Marshals Act* reads as follows:

> (4) The fire code supersedes all municipal by-laws respecting fire safety standards for buildings and other structures and premises.

Section 20 of the *Hotel Fire Safety Act* should be amended to be consistent with this Section.

4. Exhibits 311 and 315

For those who will be considering code development, I would refer them to the above Exhibits. Both of these documents were prepared by David McFadden, Barrister and Solicitor. I learned of these studies at or near the end of the Inquiry. The two studies have not been the subject of extensive discussion by those involved in the Inquiry. No cross-examination was conducted of the author and no submissions were received as to the effect of these studies.

Exhibit 311 is a study prepared for the Ontario Association of Property Standards Officers Inc. This study discusses the relationship of the FMA to the BCA and property standard by-laws. The study contains a number of recommendations which touch upon issues discussed in this Report.

Exhibit 315 is a study which discusses the interrelationship and conflicts which the author has observed between the BCA, the FMA, the *Planning Act* and the *Ontario Water Resources Act*. The study also considers the effect of 21 other Provincial Acts relating to inspection, building construction and fire safety requirements, and also contains a number of recommendations.

[1] Exhibit 123.

[2] Exhibit 122, Report of the Ontario Committee on Uniform Building Standards for Ontario, 1969; Appendix B.

[3] See Exhibits 274 and 275 for the present use of the NBC and NFC across Canada.

[4] Exhibit 122, p. 12.

[5] For the organizational chart of this Ministry, see Exhibit 131.

[6] OBC, Sentence 3.2.4.7(1).

[7] OBC, Part 5.

[8] Transcript, Volume 61, p. 24.

[9] Transcript, Volume 61, pp. 9 to 19.

[10] Fodor Engineering, *A Study of Fire Safety Requirements in Tall Apartment Buildings*, 1976.

[11] *Ibid*. p. A2.

[12] Dunlop Farrow Aitken, *A Study of the Additional Requirements for High Commercial Buildings*, 1982.

[13] Exhibit 226, p. i.

[14] Exhibit 226, p. i.

[15] Exhibit 64, Standing Committee on the Administration of Justice Proceedings.

[16] Brief 54, p. 7.

[17] *Fire Marshals Act*, S.O. 1981, c.8, s. 18a(4).

[18] Exhibit 94.

[19] Exhibit 56 and 56A.

[20] Transcript, Volume 9, pp. 124 to 127.

[21] Exhibit 122, p. 12.

[22] *Building Code Act*, R.S.O. 1980, c.51, s.27.

[23] *Fire Marshals Act*, S.O. 1981, c.8, s. 18a(4).

[24] Exhibits 122, 213, 305, 310; see also infra, Volume 2, Part B.1.

[25] Exhibit 151.

[26] Exhibit 84, p. 100.

[27] Exhibit 102.

[28] Exhibit 132.

[29] Transcript, Volume 61, p. 92.

[30] Exhibit 209 and 308.

[31] Exhibit 186.

[32] Transcript, Volume 44, p. 15.

[33] For further discussion see Chapter 15 under "timing".

[34] Exhibit 179 and 180; also see Chapter 15.

[35] Transcript, Volume 44, p. 10.

[36] Exhibits 209 and 308.

[37] Recommendation 8.8.

[38] Fire Journal, May, 1981 "A Brief Look at the Hotel Fire Record", p. 38.

[39] For examples of the committees, see Exhibit 127.

[40] Transcript, Volume 61, p. 74.

[41] *Fire Marshals Act*, S.O. 1981, c.8, s. 18(7) enacted but not proclaimed.

[42] Transcript, Volume 43, pp. 13 to 26.

[43] Exhibits 42 and 43.

[44] Exhibit 309.

[45] Exhibit 132, Appendix, Page 3, Item G; evidence of Rashmi Nathwani, Transcript, Volume 45, pp. 48 to 49; Exhibit 119, p. 102.

Chapter 3

Apartment Buildings

INTRODUCTION

There are approximately 2,500 highrise apartment buildings in Ontario located primarily in the twelve largest cities, and those highrise apartment buildings constitute the largest percentage of all highrise buildings in the Province.[1] In Metropolitan Toronto, approximately 80% of the highrise buildings are apartment buildings. About 1.3 million people in Ontario live in highrise apartments.[2]

The Urban Development Institute (UDI), the Housing and Urban Development Association of Canada, Ontario Council (HUDAC), and the Metropolitan Toronto Apartment Builders Association (MTABA) were granted standing and were represented by Counsel throughout the Inquiry. The views of tenants of apartment buildings were put forward by individuals through their briefs and evidence [3] and collectively through the Federation of Metro Tenants Associations which was granted standing before the Inquiry.

This Chapter deals with highrise apartment buildings and the three following Chapters will discuss highrise hotels, offices, and institutional buildings.

In addition to reviewing actual fires which have occurred in the four types of highrise buildings referred to, Chapters 3 through 6 will, in relation to each occupancy, describe some of the positive and negative aspects of these buildings from a fire safety point of view. The effectiveness of fire safety plans is influenced by the degree of control of occupants by building management, and therefore the subject of control will also be discussed.

As discussed in Chapter 2, Ontario has had a uniform building code since December 31, 1975. Before 1975, building construction standards varied from municipality to municipality.

Since the 1950's, the NBC has contained provisions for highrise apartment buildings to be constructed in a manner which would result in each apartment being a unit separated from other apartments and the corridor by walls which have a defined fire resistance rating and doors with a defined fire protection rating. Generally speaking, these ratings stipulate the length of time that dividing walls which form the outside perimeter of each apartment, and doors of entry to the apartment, must withstand flames. Where the NBC had been adopted as the building regulation, or where local building by-laws had similar requirements, this important characteristic of apartment buildings, referred to as "compartmentation", exists as a positive feature of apartment buildings.[4] Although not a code requirement, most highrise apartment buildings have balconies which can provide an area of safety in a fire emergency.

For many years the NBC has also contained requirements related to other essential fire safety features such as fire alarm systems, egress facilities, and suppression devices. Its provisions regarding these matters have also changed over the years.

The existence of highrise buildings that have been constructed according to many different building standards has an impact on fire and life safety, and gives rise to the issue of retrofit.[5]

The opportunity for occupants to become intimately familiar with the fire safety features and evacuation procedures of their building should be greatest in highrise apartment buildings. Unfortunately, building management and occupants are not taking advantage of this opportunity.

The control of occupants by management is less structured in apartment buildings than in other highrise occupancies. It must be recognized that occupants of apartment buildings, whether tenants or owners of condominium units, are in their own homes. Direct contact between management and occupants relating to all matters, including fire prevention and fire safety procedures, appears to be limited.

The failure to have cooperative and effective fire safety planning in apartment buildings may result from an inability to exercise control over occupants, or shared apathy of management and occupants regarding fire safety, or a combination of both. In any event, the challenge to be met in highrise apartment buildings is to actively involve both management and occupants in fire safety. The answer would appear to lie in effective educational programs which will increase awareness of the importance of fire safety. Both management and occupants must view fire safety within their own buildings as a matter for which they have some responsibility.[6]

THE FIRES

The Inquiry studied five recent fires in highrise apartment buildings in Ontario. Three of those fires involved fatalities. In two of those fires, death occurred not in the suite of origin, but in an exit stairwell. It should be noted that fatalities in highrise apartment fires are rare when considering the total number of apartment fires which occur on a yearly basis. Most apartment fires originate in apartment suites and are contained within those suites with no loss of life. The fires which are outlined in the next part of this Chapter were the subject of evidence before the Inquiry. Those fires are described to illustrate common contributory causes of property and life loss. It is also hoped that the descriptions will assist the reader in appreciating the significance of some of the recommendations contained in this report.

The fires which are reviewed occurred at 88 Bloor Street East, 20 Falstaff Avenue, 21 Richgrove Drive, and 800 Richmond Street in Metropolitan Toronto; and at 170 Lees Avenue in Ottawa, Ontario.

88 Bloor Street East

A fire occurred on August 19, 1982 in the apartment section of the Hudson's Bay Centre complex at 88 Bloor Street East in Toronto, Ontario. There was one fatality. The following description of the building and of the fire comes from a report of the Office of the Fire Marshal, and the evidence of Peter Gathercole, a witness before the Inquiry. While there may have been changes in the intervening time, I will describe the building as it was at the time of the fire.[7]

Description of the Building:

The entire complex was constructed between 1974 and 1975. The Centre included a number of Phases. Phase 1 is a 37 storey office tower, Phase 2 contains 6 floors, five of which are retail floors.

Phase 3 consists of three levels of basement parking, five levels of retail floors and six levels of hotel floors, being the southern portion of the hotel. The apartment tower is superimposed on this portion of the hotel.

There was a single entrance for the hotel and the apartment tower. There were two individual and separated lobbies inside the entrance. One contained elevators which served the apartment floors only. The other contained the hotel registration desk and elevators serving the hotel floors.

The twelfth floor level contained a mechanical and electrical service floor. There were apartments on the next 24 levels, with another mechanical and electrical service floor on the 38th level. The elevator winding room was located at the 39th floor level, and was reached by way of stairs.

The tower was constructed of reinforced concrete.

There were 14 apartments on each floor with a central corridor. Three elevators were located at the mid-point of the corridor. Stairs extended from the 38th level near each end of the corridor. These stairs terminated at the 12th floor level, where short corridors led to a second pair of exit stairs which then went down through the hotel to the street level.

The apartments did not have balconies.

Chronology:

After the other members of her family had left for the day, the occupant of Apartment 1809 spent part of the morning in the livingroom, reading the paper and having a cigarette. At some point, she left the livingroom. Upon returning, she became aware of a fire involving the couch in the livingroom. It seems that a cigarette ignited some newspaper and that, in turn, set the couch on fire. She made some attempts to extinguish the fire and then fled the apartment, leaving the door open.

The couch was made of polyurethane foam covered with a cotton velvet. Tests conducted by the research laboratory at the Ontario Fire College determined that, upon ignition, this type of couch would burn at a rate which would make the room conditions untenable within 4 to 5 minutes.

The tenant attempted to sound the fire alarm on the 17th floor but was unable to break the glass rod. She subsequently activated the alarm on the 16th floor and then proceeded down the stairs and informed the building staff that the fire was in her apartment.

The fire department arrived in short order and examined the annunciator panel. According to that panel, the fire alarm had been initiated at several levels, the lowest being the 16th floor. On the assumption that this was the floor of fire origin, the fire service took the elevator to the 15th floor. The normal procedure in fighting a highrise fire is to proceed to the floor below the fire floor and to attack the fire by gaining access through the stairwell. The firefighters were subsequently advised by radio of the location of the fire and proceeded to the 17th floor by way of the stairs. They hooked up their hose to the building water system and began to attack the fire on the 18th floor. Shortly thereafter, the normal power supply for the building failed and the emergency power supply did not come on.

For that reason, the fire department lost power to a number of services, most significantly the firefighter's elevator and the fire pump. This obliged the fire service to stop its operation long enough to hook up their hoses to the exterior siamese connection. Thereafter, they had to walk up to the fire floor, a distance of 18 storeys, carrying all the necessary equipment. For these reasons, the fire was not brought under control for almost two hours.

I had the opportunity to visit the scene of this fire. I must comment that, as a person with no previous experience of this sort, I found the damage in the suite of origin much more extensive than I expected. None of the living-room furnishings remained. I was only able to determine where the couch and other furnishings had been from the investigators' markings. I would describe the suite of origin as a pile of rubble.

All that remained of the door to the suite were the hinges. The wall between the living-room and the kitchen was gone, leaving only the metal supports and the conduits. The kitchen counter and cabinets were gone.

I was impressed by the comparison between the utter destruction in the suite of origin and the good condition of the apartment next door. At least insofar as the flames were concerned, the separation between the suites had been effective throughout the fire.[8]

Smoke Migration:

This fire took place in the summer, when the exterior temperature of the building was quite similar to that inside. For that reason, there was little natural stack action at the beginning of the fire. However, because of the duration of the fire, the heat of the fire itself produced stack action and turbulence within the building.

When the occupant fled her apartment, the door was left open and substantial heat and smoke poured out of the apartment into the hall on the 18th floor. The smoke then entered the elevator shafts. When the fire alarm system was activated, all air pressurization fans shut down. Smoke and heat entered the corridor pressurization system and the kitchen and bathroom exhaust risers. While there was some smoke movement in a downward direction in the early stages of the fire, once the building had heated up sufficiently all smoke movement was upward. The principal path of smoke migration from floor to floor was the elevator shaft.

The large amount of smoke generated in this fire is directly related to the unusual length of time that this fire burned and to the nature of the furnishings. A substantial amount of smoke moved into the stairwells during attempts to extinguish the fire. The door to the roof was forced open by tenants at one stage in the fire. That door does not open directly to the stairwell, and therefore this did not contribute to stack action in the stairwell in this case.

> "The speed of smoke travel through the elevator shafts is demonstrated by the fact that in this instance, the fire was annunciated at the 39th floor level, i.e., the elevator winding room level when the fire department first responded only four minutes after the first fire alarm sounded."[9]

In other words, within four minutes, smoke had migrated to the 39th floor level and triggered the smoke detector in the elevator winding room.

Fire Alarm System:

There was a single fire alarm system for the apartment tower, hotel and retail part of the Centre. If the alarm was initiated in the apartment building, there would be a general evacuation alarm through the apartment tower, and a warning alarm in the hotel and retail sections.

This building was connected to a monitoring station outside the building. This qualifies under the OBC as a direct connection to the fire department.[10]

The occupant who discovered the fire reported having difficulty in pulling the manual pull station on the 17th floor. The annunciator panel indicated that detection devices or manual pull stations had been activated on four different floors. This resulted in some confusion on the part of the fire department when attempting to determine the location of the fire.

Tenants in this building advised investigators from the Office of the Fire Marshal that there had been a number of false alarms in the building. This, they felt, resulted in a tendency to ignore the fire alarm.

> "The loss of confidence in the fire alarm system together with the loss of confidence in the annunciator panel effectively invalidates the entire system. A serious study should be undertaken to redesign the fire alarm system in the light of modern technology and with a realistic understanding of tenant behaviour."[11]

Suppression:

Although the fire department arrived at the fire within four minutes of the activation of the fire alarm, the fire was not extinguished for almost two hours.

After checking the annunciator panel, the first firefighters went to the 15th floor. This was expected to be the floor immediately below the fire floor. At that time, the occupant of Apartment 1809 had informed building staff that her apartment was the room of fire origin. The fire department was notified of this by radio. The firefighters then connected their hoses on the 17th floor and climbed up the stairs to the 18th floor and began to attack the fire. Shortly thereafter, all power to the Complex was lost. The loss of pump pressure and the resulting loss of throw from the hose obliged the firefighters to leave the fire floor. They connected to the exterior siamese connection re-establishing water pressure. Then they attempted to regain ground on the fire floor. However, by this time it was necessary for them to climb the stairs from the street to the fire floor, transporting all other necessary equipment by hand. All emergency lighting had been lost, leaving the fire department to rely on hand lamps.

All of this difficulty arose because of the loss of power in the complex, and the subsequent failure of the emergency power supply to start. The power supply failed initially as a result of the introduction of water from the firefighting activities into the electrical supply.

> "It was found that water fell from the 17th floor level to the 12th floor electrical room, apparently by cascading down the bus duct system. . . .Necessarily, the cases containing the bus bars or conductors must be perforated to allow for heat radiation and cooling and although this equipment is contained within locked electrical closets, sufficient water flowed under the closet door and down the bus duct system to be able to reach the 12th floor below in quantity."[12]

Substantial investigation by the Office of the Fire Marshal was unable to pinpoint the exact cause of the failure of the emergency power supply to start. In any case, it eventually had to be started by hand and that could not be done until after the fire was put out because the generator was located on the 38th floor. It was impossible to pass the fire floor and walk up to the 38th floor to manually start the emergency power until after the fire had been extinguished.

Egress (Tenant and Staff Action):

> "Few, if any tenants were able to evacuate the building once the fire became established. A number of people from the floors above the fire floor attempted to evacuate but were obliged to retire to their own apartment or other apartments which were available to them. By the time the majority of the tenants located above the fire floor became aware that the fire was in progress, the possibility of evacuation was lost. As stated previously, most tenants did not respond to the alarm as a result of the previous false alarm experience.
>
> Some tenants, upon being prevented from evacuating downward through either stair climbed to the 38th floor level where they climbed to the roof level via the stair serving the elevator winding room. Upon reaching that level, they were unable to make exit onto the roof because the door was locked. [These tenants subsequently forced the door open and made their way to the roof].
>
> Those persons who attempted to evacuate downward through the exit stairs, reported that the smoke became very dense at the 22nd floor level approximately and that they were forced to withdraw to higher levels in the building as a result. Mr. Campbell [the deceased who resided on the 30th floor] was found lying in the west stair at the 21st floor level."[13]

Investigation was also made of the activities of building staff.

> "During the investigation it became apparent that there was a conflict of roles between the hotel and the apartment tower staff. Initial calls made by tenants inadvertently to the hotel lobby desk were met with disinterest and this apparently results from some confusion on the part of tenants as to which is the correct number to call in case of emergency. This is a matter that needs to be resolved by greater staff training and in particular that provision of persons knowledgeable of both the apartment and hotel sections of the building to be on duty at all times to handle this type of emergency."[14]

A further problem was experienced in this fire. Although this building was equipped with a voice communication system, it was found that the system was not audible throughout the building and that there was some problem with operator training.

Due to a basic equipment fault, the system could not be heard by occupants of apartments unless they stood in the hallways. Further, some difficulty arose when a single floor was selected at the same time as the "all-call button" was pushed. The floor that had been separately selected suffered a reduction in volume of about 50%.

When using the system microphone, it was found necessary to push the microphone right up against the upper lip. If the microphone was moved as much as 3 inches away from the mouth, there was a serious reduction in audibility of the system.

Results:

An inquest was held into the death of Basil Campbell. Mr. Campbell was found in the stairwell at the 21st floor.

The jury made a number of recommendations. They referred to the multiplicity of fire prevention legislation in the Province, suggested that smoke control systems should be mandatory for all highrise buildings, suggested that emergency power supply systems should be located at grade, and added that federal and provincial governments should set standards of flammability and toxicity of furnishings. They also emphasized the need for public education.

Significant Findings and Conclusions Arising from this Fire

1. The source of ignition was smoking materials.
2. The door to the room of fire origin was left open and provided an avenue of smoke migration.
3. The elevator shaft was the prime avenue of smoke migration.
4. The fire dampers in the corridor pressurization registers did not prevent the movement of smoke into those registers.
5. False annunciation was a major problem in this fire alarm system.
6. The voice communication system had serious audibility problems.
7. The evacuation was made difficult and firefighting activities rendered hazardous and arduous as the result of the failure of the normal power supply and the emergency power supply.
8. Occupants went to the roof, gaining access by forcing open a locked door.

800 Richmond Street West

On September 26, 1982, there was a fire in the basement of an apartment building at 800 Richmond Street West, Toronto. The description of the building and of the fire is taken from the report done by the OFM, from the evidence given by Peter Gathercole and Assistant Deputy Chief Sproule.[15]

Description of the Building:

This 13 storey apartment building was part of a residential complex, consisting of townhouses, lowrise apartments and the highrise tower. The whole complex was laid out in a square with a central court. The highrise apartment building was constructed of poured, reinforced concrete with brick exterior curtain walls. This means that there was a space between the interior walls of the apartments and the exterior brick wall. The building was constructed in the early 1970's, prior to the enactment of the *Building Code Act*. At that time the City of Toronto had its own municipal building by-law.

The design of the apartment building was the familiar double-loaded corridor; that is, there was a central corridor extending the full length of the building and connecting with the stairwells at each end. The apartments were on either side of the corridor. The elevators were centrally located on one side of the corridor.

There were two registers at either end of the corridor which supplied air from roof-mounted fans into the central corridor and from there into the apartment suites. The individual apartments had kitchen and bathroom exhaust vents. Air from the suite would move through the vent into a riser extending throughout the height of the building.

There was a single electrical power supply coming into the building. However, there was a distribution system which divided the supply so that the east and west halves of the building were served by two separate bus duct systems. Emergency power was provided, but the generator was designed to come on only if power was lost in both halves of the building.

A separate emergency power supply was provided for the fire alarm system, and was meant to be powered by batteries.

There were two sprinkler systems in the building. The unheated underground parking garage was protected by a dry system, that is a system that is not charged with water at all times. This type of system is used in cold climates so that water standing in the pipes will not freeze and break the pipes. The basement of the building was protected with a wet system, that is, a system which is normally charged with water at all times.

Chronology:

The fire, which was of undetermined origin, began in lockers which had been built against one wall in the basement corridor. Because the sprinkler system had been shut off, the fire was able to grow to the extent that it vented up the west stairwell. The door to that stairwell had been wedged open and had a defective self-closing device. The fire also attacked the power supply cables which fed one-half of the building and eliminated power as a result. However, as only one-half of the system failed, the emergency power supply did not activate.

Eventually, a tenant who entered the underground corridor from the parking garage discovered the fire. The Toronto Fire Department was called and the fire was extinguished in short order.

Smoke Migration:

The stair door at the bottom of the west stair tower was propped open at the time of the fire with a wooden wedge. Also, stair doors at several of the upper levels were propped open, some being held open by fire extinguishers which had been removed from their cabinets. For this reason, smoke moved directly from the basement up the west stair tower and onto upper floor levels. Smoke was so dense throughout the building that no attempt was made to evacuate by most of the occupants. The most severe smoke damage was found to be at the 9th floor level.

Fire Alarm System:

The fire alarm system in the building did not sound.

> "The stand-by battery power supply for the fire alarm system was examined, and it was found that the batteries, which were supported on a piece of 1 × 12 pine, supported by concrete blocks, was heavily coated with a layer of what appeared to be cement. Bags of cement were stored in the electrical distribution room at the basement level on the north side, among other things.
>
> There were 4 batteries which were connected in series to provide a 24 volt supply. All of the cells in the battery, three cells per battery, showed a lack of electrolyte. Many of the cells had lost one third of their electrolyte and some were completely empty. There was no evidence of leakage of electrolyte onto the timber which supported the batteries. Two, one gallon, plastic bottles of distilled water were found in the vicinity of the panel, one of which contained approximately 2 inches of water. The other was empty. Neither bottle was capped, the two caps being found on the surface of the timber which support the batteries."[16]

All of this indicates that the emergency power supply for the fire alarm system had been badly neglected and was incapable of providing standby power to the fire alarm system.

At the time of the inspection, the fire alarm system was set to the "silence" position. It is not clear whether this was done before the fire.

Suppression:

The area of fire origin was protected with a wet sprinkler system. However, the sprinkler system failed to operate.

The sprinkler system in the building consisted of a dry system in the underground parking garage, and the wet system which served the basement. There were five shut-off valves, three for the dry system and two for the wet system. All of the control valves for the sprinkler system were turned off at the time of the fire. Apparently, this had been done by a plumber who was trying to correct a problem which had been experienced with the *dry* pipe system. Upon examination, it was found that the dry system contained numerous broken fittings. Mr. Gathercole, believes that the fittings were broken due to water freezing in the pipes. This condition, in his view, dated from the previous winter at least. It is not known how long the system had been turned off, but it seems fair to assume that it had been inoperative for a significant length of time.

In any case, it was unnecessary to turn off both the wet system and the dry system in order to repair the dry system.

> "This indicates that the person who turned off the sprinkler control valve was not familiar with the system and not competent to operate it, therefore."[17]

If the wet system had not been turned off the fire would have been extinguished by the operation of one or two sprinkler heads.

Egress (Tenant and Staff Action):

The building became smoke logged so quickly that it was impossible for most occupants to evacuate.

Results:

The owner of 800 Richmond Street was charged under the *Fire Marshals Act* with 25 violations of the Ontario Fire Code. The charges fell into a number of categories, generally being directed to the failure to keep fire doors closed and to maintain self-closing devices, the failure to maintain the emergency power supply for the fire alarm system, the failure to maintain the sprinkler systems, the failure to notify the fire department that the sprinkler system was shut off, and the failure to prepare a fire safety plan. On October 29, 1982, the owner pleaded guilty in Provincial Court (Criminal Division) and was fined a total of $12,000.00.[18]

Significant Findings and Conclusions arising from this Fire:

1. The entire automatic water sprinkler protection for this building was turned off at the time of the fire.
2. Failure to maintain the standby electrical power supply batteries for the fire alarm system was the direct cause for the failure of the fire alarm to sound.
3. The failure to check that fire doors were in the closed position contributed to smoke movement throughout the building.
4. General lack of maintenance in this building exposed occupants to significant danger.

20 Falstaff Avenue

On April 17, 1983, there was a fire at 20 Falstaff Avenue in North York. The information about this building and fire is taken from the evidence of Joseph Gibson, Fire Chief of North York.[19]

Description of the Building:

This apartment building, which was built in 1970, contained a hundred and ninety-six suites on 19 floors. The building was owned by the Ontario Housing Corporation. Because of OHC policy, each suite was provided with a hard wired smoke detector. This means that the detectors were directly wired into the electrical system, and did not rely on batteries.

Chronology:

This fire was discovered by the occupants of Apartment 1004 in a bedroom. Apparently, the smoke detector in that apartment did not activate.

Smoke Migration:

There was not a significant amount of smoke migration through the stairwells. Evidence of smoke migration was found from the 10th to the 19th floors. The major path of smoke migration was the elevator shaft. There was some smoke migration as a result of firefighting activities. However, it appears that there was some significant smoke migration through the air circulation system.

Fire Alarm System:

This building had a single-stage general evacuation fire alarm system. According to Chief Gibson, the North York Fire Department had been called to this building on 79 occasions between January 1, 1982 and April 20, 1983. Ten of these calls had been the result of actual fires. This leaves a significant number of false alarms, due either to malfunction of the system or to malicious false alarms.

Suppression:

The fire department was notified by telephone at 9:21 p.m. Eleven crews were involved in suppression and rescue. It was necessary to resuscitate persons in Apartments 1012 and 2011. Both of these apartments are well removed from the suite of fire origin. This supports Chief Gibson's view that the air handling system was a significant path of smoke migration.

By 10:40 p.m., almost all of the occupants were able to return to the building.

Egress (Tenant and Staff Action):

When they arrived at the fire scene, the fire service found many tenants had begun evacuation. There was a security service on a 24-hour basis which patroled three buildings in this complex. The firefighters found that the security personnel were on the scene and had an elevator waiting for the use of the firefighters.

Five occupants and three firefighters were hospitalized after this fire.

Significant Findings and Conclusions arising from this Fire:

1. The air handling system was a significant path of smoke migration.
2. There had been a large number of fire alarms in this building.

21 Richgrove Drive

A fire occurred at 21 Richgrove Drive, Etobicoke, on April 19, 1983. There was one fatality. Fire Chief Bryan Mitchell provided the Inquiry with various reports and further information about this fire.[20]

Description of the Building:

This 11 storey apartment building was built in 1968, and was typical in design. It had a double-loaded corridor with elevators at the mid-point and stairwells at each end.

Smoke barrier doors on the stairwells did not have door closing devices, although they had apparently been installed at one time. Because this building was built prior to the BCA, it was not required to have, and did not in fact have, smoke detectors in the apartments, or door closers on the doors to apartments. There was partial sprinklering in the locker rooms of this building.

Chronology:

The suite of fire origin was occupied by a husband and wife and their 39 year old son. This suite was on the 7th floor of the apartment building. The apartment had two bedrooms. Between the bedrooms were the bathroom, kitchen, livingroom and diningroom.

The parents retired at approximately 11 p.m., and the son stayed up to watch a hockey game that ended just after midnight. Investigators believe that the son lit a cigarette while in bed at around 3:30 or 4 a.m. The cigarette smoldered for some time and eventually the bed clothes caught fire.

Although the apartment had no smoke detectors, the parents were awakened by smoke. The parents tried to reach the son, but when they opened the son's bedroom door, they were driven back by a blast of smoke and heat.

The parents fled the suite leaving the suite door open.

Smoke Migration:

Door closing devices had been removed from the smoke barrier doors in the stairwells. The screw holes, made when the devices had been originally installed, were visible.

When the parents left the suite of origin, leaving the door open, smoke raced along the corridors and up the stairwells, filling all corridors from the 11th floor to the 5th with smoke.

Suppression:

The fire department received a call at 6:30 a.m. The first vehicle arrived at 6:34 and the fire was declared out at 7:05.

Firefighting was hampered by a number of factors. The siamese connection could not be located, and was later found to be a free-standing pipe in the rear parking lot.

The firefighters attempted to open the roof hatch covers in the stairwells in order to vent smoke. The hatches could not be opened from the inside. When the aerial ladder was raised to the roof, the firefighters found that the hatches were held down with concrete blocks.

The key given to firefighters to open the door to the roof was the wrong key.

Egress (Tenant and Staff Action):

The fire alarm in the building was activated at 6:30. Upon arrival, the fire department found about 60 tenants in the main floor lobby. Most of the other tenants remained in their suites.

Some tenants attempted to evacuate by elevator. The elevator became overloaded and stopped about 1 metre below the main floor level. For this reason, the doors did not open, and firefighters had to rescue these persons.

This fire resulted in the death of Barry Ansell, in the room of fire origin. He died of carbon monoxide poisoning and suffered third degree burns to 100% of his body.

Significant Findings and Conclusions arising from this Fire:

1. The source of ignition was smoking materials.
2. The door to the suite was left open which resulted in significant smoke migration.
3. Door closing devices on the smoke barrier doors on the stairwells had been removed.
4. In this fire, some tenants attempted to evacuate using the elevator.
5. Firefighters were unaware of the location of the siamese connection for the standpipe. This is a matter for fire department pre-fire plans.
6. The wrong key for the roof door being given to the firefighters, and the blocked roof hatch were the results of inadequate fire safety planning.

170 Lees Avenue

At approximately 11:30 p.m. on May 19, 1983, there was a fire at 170 Lees Avenue in Ottawa. There were three fatalities. The description of this building and the details surrounding the fire are taken from two reports done for the Office of the Fire Marshal, and from the verdict of the Coroner's Jury empanelled after this fire.[21]

Description of the Building:

The apartment building at 170 Lees Avenue was a 20 storey building having a typical double-loaded corridor with elevators at the mid-point of the corridor. Doors at each end of the 185 foot corridor led to the stairwells. These stairwells ran the full height of the building, and had doors allowing access to the roof. However, the doors to the roof were locked.

The building was constructed before the passing of the BCA in 1975. Building construction in the City of Ottawa was governed at that time by a municipal building by-law. This by-law was essentially the National Building Code of Canada, 1965, Part 3, including all corrections and revisions to January, 1967. Further, and since the passing of the BCA, the City of Ottawa has passed a by-law requiring smoke alarms to be installed on a retrofit basis in apartment suites. For this reason, these apartments had smoke alarms.

Each apartment had an exterior balcony.

Chronology:

From her testimony at the subsequent inquest, it appears that the occupant of Suite 707 had been lying on her bed reading and smoking. She remembered waking up and finding her bed on fire. She then attempted for some time to extinguish the fire. Eventually, she realized that it was beyond her control and fled the apartment. She encountered other tenants on the 6th floor and told them about the fire. One of them called the fire department and then they all left the building. The fire alarm was not activated at that time.

The occupant of Apartment 907 saw smoke and flames outside the window of that apartment and pulled the fire alarm before leaving the building.

Smoke Migration:

The investigators found that the prime avenues of smoke migration were the stairwells. Both stairwells became logged with smoke, and all of the deceased died in the stairwells.

The door to the suite directly across from the suite of fire origin had a core which apparently consisted of formed sawdust. After the fire, this door was found curled up in two pieces on the floor. Although the door was 1 3/4 inches in thickness, it could not be considered to be a solid wood core door.

Fire Alarm System:

The fire alarm system in this building was a single-stage general evacuation fire alarm system. There was no direct connection to the fire department. The system was activated by an occupant on the 9th floor.

Before the fire, inspections by the Ottawa Fire Department and by a private contractor, indicated that several of the bells were not in good repair. Many of them did not sound at the time of the fire. However, inspectors believe that at the time of the fire, the fire alarm system was audible throughout the building.

This building was provided with a voice communication system. This system was not used during the fire either by supervisory staff or by the fire department.

It appears that a number of the smoke alarms in suites did not activate.

Suppression:

The fire department received the call at 11:40 p.m.

> "The first crew of firefighters took the firefighter's elevator to the 6th floor and brought their own hose. They connected their hose to the standpipe and took the hose up the south stairwell to the fire floor. The second crew of firefighters connected their hose to the north standpipe on the 6th floor. They took the hose up the north stairwell and found that it would not reach the fire. They apparently then used the north standpipe on the 7th floor. The hose would keep the 6th and 7th floor stairwell doors partially open. Also, the doors would be opened by firefighters and tenants evacuating these floors."[22]

The firefighters extinguished the fire in 15 to 20 minutes from the time of their arrival.

Egress (Tenant and Staff Action):

When he heard the fire alarm sound, the superintendent left his apartment. He encountered the occupant of apartment 707, who told him the fire was in her apartment. He then called the elevators to the ground floor for the use of firefighters.

Investigation by the Office of the Fire Marshal showed that there was no fire safety plan prepared or filed for this building. Upon hearing the fire alarm, some occupants evacuated, some stayed in their apartments, and some attempted to evacuate and then returned to their apartments.

One family was awakened in their 21st floor apartment by the fire alarm. They attempted to evacuate by one stairwell and were driven back by smoke. They crossed the building and tried the second stairwell and again were unsuccessful. They then climbed up the stairs to the roof. Here they found the door to the roof locked. The mother and child remained at this point while the father attempted to get help. The child was pronounced dead on arrival at Children's Hospital in Ottawa, while the mother died at Ottawa General Hospital.

A second family was awakened by the sound of the arriving fire trucks. They left their 15th floor apartment and attempted to evacuate by the stairs. They turned back at about the 8th floor level and continued up the stairs to the 16th floor. Firefighters found the six family members unconscious in the stairwell. Their 4 year old child was taken to Sick Children's Hospital in Ottawa where she died.

Results:

In July, 1983, an inquest was held into the three deaths in this fire. The Coroner's Jury found the cause of death in all cases to be smoke inhalation. The jury made a number of recommendations. Their major concerns were the need for education of tenants in evacuation procedures, maintenance of smoke alarms, the fire rating of apartment doors, and the use of voice communication systems.

Significant Findings and Conclusions arising from this Fire:

1. The source of ignition was smoking materials.
2. Occupants attempted to go to the roof, and the door to the roof was locked.
3. There was no fire safety plan in this building.
4. Supervisory staff and fire service did not use the voice communication system.
5. Doors installed on the suites were not fire-rated or 1 ¾ inch solid core wood doors.
6. A number of smoke alarms did not activate.
7. The deceased were unfamiliar with the procedures to be followed in case of fire.

STATISTICS

In Chapter I, highrise apartment dwellers' perception of the hazard of living in highrise apartments is described.

As discussed, the actual fire safety record in highrise apartment buildings is better than the occupants believe it to be. In Ontario, the death rate per 100,000 population for residential buildings 4 storeys and under for the period of 1976-1981 was 2.09, whereas the death rate for residential buildings 5 storeys and greater for the same period was 1.56. The injury rate for the same two categories of buildings were 11.2 and 17.8 per 100,000, respectively.[23] In addition, between 1976 and 1981, there was only one multiple death in apartment buildings 7 storeys and greater, and that multiple death occurred in the suite of origin.[24]

A review of the statistics regarding death and injuries in residential buildings (both low and highrise) indicates that in absolute numbers, there are considerably more injuries and deaths in lowrise in comparison to highrise buildings. This is not surprising as there are many more lowrise buildings in Ontario and therefore many more people living in lowrise buildings. This may be a statement of the obvious, but I have made it because there were strong submissions made to the Inquiry that these absolute numbers should be relied on in assessing the risk of injury or death in highrise buildings.

I must stress that if one is attempting to compare the relative safety of lowrise and highrise buildings, these absolute numbers of injuries and deaths are not relevant. Only by having a common base upon which to compare, in this case population, can a proper evaluation of relative safety be made.

SUPERVISORY STAFF/ BUILDING SUPERINTENDENTS

Recommendation:

3.1 Every highrise building should have full-time, on-site supervisory staff.

Although this recommendation applies to all highrise buildings, it will have the greatest impact on highrise apartment buildings. The Ontario Fire Code contains the following definition:

> Supervisory staff means those occupants of a building who have some delegated responsibility for the fire safety of other occupants under the fire safety plan and may also refer to the local fire department where it assumes these responsibilities.[25]

The Ontario Fire Code places a great deal of emphasis on emergency planning, in particular the preparation of a fire safety plan. I will be dealing with the issue of fire safety plans in Chapter 15. However, it is appropriate at this stage to note that supervisory staff are expected to be quite intimately involved in procedures established by the fire safety plan. The Ontario Fire Code provides:

> 2.8.1.2(1) Supervisory staff shall be instructed in the fire emergency procedures as described in the fire safety plan before they are given any responsibility for fire safety.
>
> 2.8.1.2(2) It is not necessary that the supervisory staff be in the building on a continuous basis, but they shall be available on notification of a fire emergency to fulfill their obligation as described in the fire safety plan.
>
> 2.8.2.4(1) In buildings within the scope of Subsection 3.2.6 of the Building Code, [high buildings] the fire safety plan shall, in addition to the requirements of Sentence 2.8.2.1(1) include:
>
> (a) the instruction of supervisory staff on the use of the voice communication system,
>
> (b) the procedures for use of elevators and for evacuation of non-ambulatory occupants,
>
> (c) the action to be taken by supervisory staff in initiating any smoke control or other fire emergency systems installed in a building in the event of fire until the fire department arrives, and

(d) the procedures established to facilitate fire department access to the building and fire location within the building.

It should be noted that sentence 2.8.2.4(1) assigns specific duties to supervisory staff in high buildings which are *in addition* to those expected of supervisory staff in all buildings that are required to have fire safety plans.

The OFC requires the maintenance of life safety systems in a building, such as fire alarms and sprinkler systems. The Code sets out a program of checks, inspections and tests which must be carried out at set intervals. For example, the fire doors must be checked daily to ensure that they are properly closed.

Tenants should be educated about the fire safety plan and life safety features of their building. It was suggested that supervisory staff should play a substantial role in this area.

In high commercial buildings there are generally a number of persons on staff to carry out these functions. The responsibilities are divided between management and superintendents in various ways, but it appears that personnel necessary to fulfill these functions are available 24 hours a day. This is not always true of highrise apartment buildings.

Mr. Marvin Sadowski, of Maysfield Property Management, said that he believed that most highrise apartment buildings do have what he described as "full-time superintendents". On the other hand, Scarborough Fire Chief William Wretham, and an Ontario Housing Corporation tenant, Junie Boudreau, described a number of buildings which do not have a "full-time superintendent". The absence of such a person when a fire occurs would result in a failure to provide the services required of supervisory staff pursuant to Section 2.8 of the Ontario Fire Code.[26] This failure can have obvious adverse effects on both the fire service and the tenants. The absence of such a person may also cause difficulty for the fire prevention officers who require access to secured areas of buildings during inspections and who may require information pertaining to the building at the time of the inspection.

Although the required maintenance of highrise buildings could be provided by an outside agency, I find it difficult to imagine how the duties listed in the OFC, particularly the frequent checks and inspections, can be adequately undertaken in highrise buildings by part-time or off premises staff. I have the same concerns as to the conducting of fire drills and the education of tenants.

There must, in my view, be full-time, on-site supervisory staff for each highrise building who will take charge in emergencies. The clear implication of sentence 2.8.2.4(1) of the OFC is that on-site supervisory staff is required at the present time. As some doubt existed as to the accuracy of this interpretation, I believe the OFC should be amended to eliminate any doubt regarding this requirement. It seems only reasonable that supervision during emergencies should be done by a person who is fully aware of the life safety systems in the building and is involved in the ongoing maintenance.

Recommendation:

3.2 Where the local fire department assumes the responsibility of supervisory staff, the costs incurred by the municipalities should be recoverable from the building owner.

Although the OFC suggests that the local fire department could assume the responsibilities of "supervisory staff", whether this occurs is within the sole discretion of the fire department.[27] I have not heard of any case where this has happened. It would appear onerous and unfair to have persons employed by municipal taxpayers given responsibility for a privately owned building, except in the most unusual circumstances. Where those circumstances exist and where the fire department, in its discretion, assumes the responsibilities of "supervisory staff" I believe the costs incurred by the municipalities should be recoverable from the building owner.

Recommendation:

> ***3.3 If any highrise building does not have in-house staff present on a twenty-four hour per day basis, the fire alarm system should be provided with a direct connection to the local fire department, or to a central station, on a retrofit basis.***

I am aware that supervisory staff in some cases will be persons who live in the building. They will not necessarily be in attendance on a 24-hour a day basis. The fires described in this report demonstrate that early notification of the fire department is essential to life safety. I have found that the majority of tenants do not understand that in most buildings, initiation of the fire alarm system does *not* automatically notify the fire department. I have also heard evidence that the cost of providing a connection through a central station is minimal, being between $300 and $600 per year for a single connection [28]

Mr. Jaffary made some comments about this matter during his submissions. He suggested that a direct connection would not be necessary in a building that had 24-hour security. Mr. Jaffary commented that the building owner must realize that if he is not providing a direct connection, he must provide staff twenty-four hours a day to phone the fire department. An on-site superintendent, whose constant attendance cannot be guaranteed, would not be sufficient to comply with the need for twenty-four hour a day staff.

ONTARIO BUILDING CODE AND APARTMENT BUILDINGS

Recommendation:

> ***3.4 All exemptions from the provisions of Subsection 3.2.6 of the Ontario Building Code granted for apartment buildings should be eliminated.***

Subsection 3.2.6 of the OBC contains additional construction requirements for highrise buildings. At the present time, apartment buildings are exempted from many of the provisions which apply to all other highrise buildings.

The proposed amendments to the OBC (Exhibit 130) recommended removal of all of the exemptions referred to except the exemption which relates to smoke control. All highrise buildings, including apartment buildings, are required to control smoke in the shaft that contains the firefighter's elevator.[29] The Ontario Building Code however requires that smoke be controlled from migrating from the fire floor to other floors and/or into exit stairwells in all highrise buildings *except* apartment buildings.[30]

In my view there is no justification for *any* of the exemptions given to apartment buildings. In Chapter 7, removal of the exemption from the requirement to have smoke control is discussed.

[1] Exhibits 4 and 4(a).

[2] Exhibit 13, p. 2.

[3] Some briefs discussing these issues are: 2, 7, 10, 13, 18, 19, 28, 31, 33, 37, 51, 75, 80 and 86.

[4] The number of municipalities using an edition of the NBC as the local Building By-Law was discussed in the Carruthers Report.

[5] Retrofit is discussed in Chapter 10.

[6] Fire safety plans are discussed in Chapter 15.

[7] Exhibits 101, 102, 103, 104, 105, 106(a) to (o); Evidence of Peter Gathercole in Transcript, Volume 17, pp. 39 to 140, Volume 18 and Volume 19, pp. 1 to 46.

[8] Exhibit 106(a) to (o).

[9] Exhibit 101, p. 23.

[10] OBC Clause 3.2.6.8(2)(d).

[11] Exhibit 101, p. 20.

[12] Exhibit 101, p. 7.

[13] Exhibit 101, p. 15.

[14] Exhibit 101, p. 26.

[15] Exhibits 109 and 110; Evidence of Peter Gathercole in Transcript, Volume 19, pp. 84 to 111; Evidence of William Sproule in Transcript, Volume 44, pp. 6 to 12.

[16] Exhibit 109, p. 4.

[17] Exhibit 109, p. 6.

[18] Exhibit 110.

[19] Evidence of Chief Joseph Gibson, Transcript Volume 60, pp. 101 to 114.

[20] Exhibit 281.

[21] Exhibit 316.

[22] Exhibit 316, p. 2.

[23] Exhibits 14 and 15.

[24] Exhibit 7.

[25] OFC Subsection 1.2.2.

[26] i.e., to use the voice communication system; initiate fire emergency systems.

[27] OFC Subsection 1.2.2. Supervisory staff ". . .may also refer to the local fire department where it assumes these responsibilities."

[28] Exhibit 309.

[29] OBC Sentence 3.2.6.2(4).

[30] OBC Sentence 3.2.6.2(2) and (3).

Chapter 4

Hotels

INTRODUCTION:

The Ontario Hotel and Motel Association was granted standing before the Inquiry. Representatives of that organization submitted a written brief,[1] and attended the Hearings from time to time in order to present evidence and cross-examine various witnesses regarding evidence relevant to the Association's interests.

The regulation of fire safety in hotels by public agencies was the subject of evidence of many witnesses including Mr. John Hess, Chief of the Hotel Fire Safety Services Unit of the Office of the Fire Marshal, the agency which is responsible for inspection of hotels pursuant to the *Hotel Fire Safety Act*.

Most fires in highrise hotels originate in guest rooms, are contained within the suite of origin, and few multiple deaths or injuries occur.[2] There is, however, a potential for catastrophe, and it is my view that spectacular, large fatality hotel fires such as the MGM Grand Hotel fire in Las Vegas and the Inn on the Park fire in Toronto, have been responsible for reviving interest in fire safety in highrise buildings.

With the exception of utility closets and areas for vending machines, the guest floors of highrise hotels are, in terms of their design and construction, similar to the residential areas of apartment buildings discussed in Chapter 3. The containment of fire by compartmentation is therefore a positive feature of the residential areas of hotels. This similarity of design and construction does not, however, allow apartments and hotels to be treated the same way when considering fire safety. The highrise hotel must be considered separately from apartment buildings and other highrise buildings because of the unique combination of both structural features and human elements.

There are large open assembly areas, usually on the lower floors of hotels, which can have an effect on the size and type of fire load in the building. In addition, there are often mercantile establishments located throughout the hotel, again, primarily on the lower floors. These mercantile establishments are usually independent business interests which are not under the same type of control as the hotel employees in terms of observing fire safety rules and being involved in fire safety plans.

The arson rate in hotels is higher than for other types of highrise buildings. This is, in part, the result of hotels being buildings to which the public has relatively easy access at all hours of the day, and is a reflection of the low degree of control over all occupants within this type of highrise building.

Hotel staff being on the premises 24 hours a day was described by the Hotel and Motel Association as a positive feature of hotels. The validity of this statement depends on the degree of training of that staff. The fires reviewed in this chapter illustrate that the presence of hotel staff is not always a positive feature.[3]

The population in hotels is transient, with guests coming from other cities and countries. They may be unfamiliar with the configuration of a particular hotel. They will, on arrival, almost certainly be unaware of the fire safety features in the building, and whether the hotel management has developed an evacuation plan for their benefit. As guests they will expect the hotel keeper to provide for their fire safety.

The existence of these features in combination with a sleeping occupancy on upper floors has been a reason for hotel fire safety being the subject of a separate provincial Act since 1888. An extensive program is being implemented by the Office of the Fire Marshal to ensure that hotel keepers provide their guests with the guidance necessary for an adequate level of life safety.

THE FIRES:

The Inquiry heard evidence and reviewed literature describing many hotel fires, but I believe that a study of three multiple-fatality hotel fires will demonstrate that a number of recurring contributory causes of property and life loss must be addressed by the appropriate authorities. The fires which are reviewed in the next part of this Chapter occurred at the Inn on the Park in Toronto, the MGM Grand Hotel in Las Vegas, and the Westchase Hilton Hotel in Houston, Texas.

The Inn on the Park

The Inn on the Park is a large hotel complex located in the City of North York, Ontario. A fire occurred in the Tower Seminar Room (Tower Room) adjacent to the second floor of the Tower Building on the morning of January 17, 1981.

The Inn on the Park is not a typical structure, and a detailed description is necessary in order for the reader to understand the events of this fire. While some changes have been made since 1981, I will describe the building as it was at the time of the fire. Much of the following information is derived from the Report of the Office of the Fire Marshal.[4]

Description of the Building:

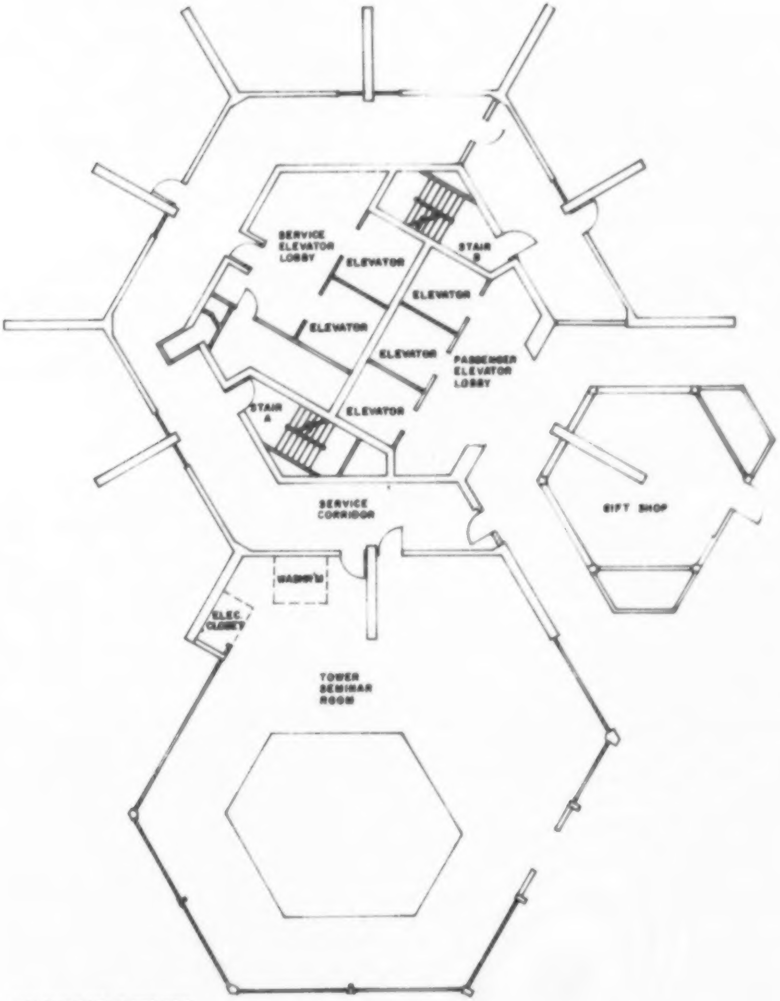
The Tower Building was a 23 storey hexagonal building with connections to other parts of the hotel complex on the first and second levels by means of passageways and corridors. The building construction was generally reinforced concrete, except for the roof of the Tower Room, a later addition.

The centre core of the Tower Building contained both passenger and service elevators, terminating at the actual 22nd floor; access to the 23rd level was gained by stairs. The top two floors were used for office purposes.

The passenger elevator shaft contained three elevators. The elevator lobbies were open to the corridor at all levels.

The service elevator shaft contained two elevators. At each level, the service elevator opened into a service lobby area which was separated from the main corridor by partitions constructed of masonry.

In addition to the elevators, the centre core area contained two stairwells, the west stairwell (Stair A) and the east stairwell (Stair B). Access to the stairwells at all levels was provided by doors. The doors to the stairwells were equipped with metal doors with self-closing devices, but no latching mechanisms. It was possible to exit to the roof from both stairwells. However, the doors to the roof were locked.

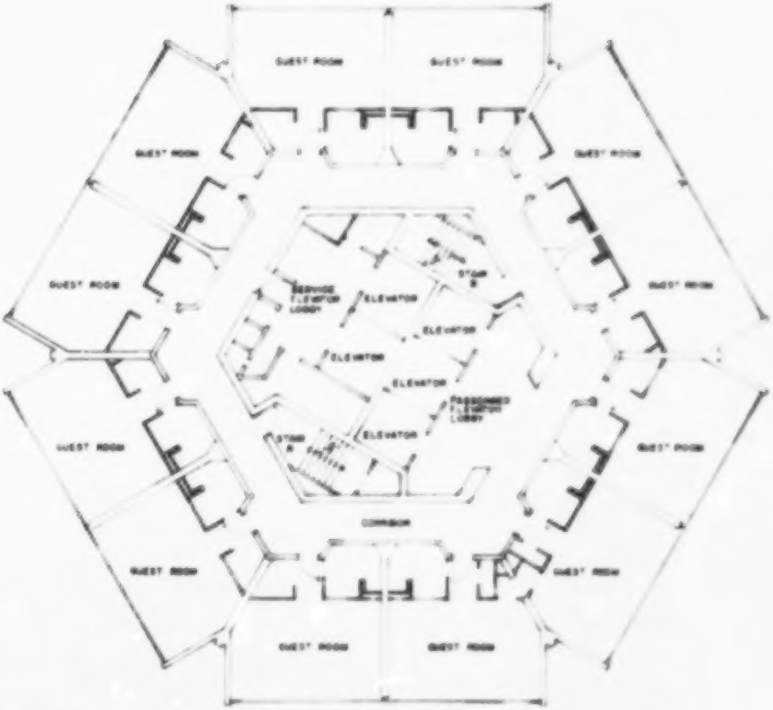

SERVICE ELEVATOR LOBBY
ELEVATOR
STAIR B
ELEVATOR
ELEVATOR
ELEVATOR
PASSENGER ELEVATOR LOBBY
STAIR A
ELEVATOR
SERVICE CORRIDOR
GIFT SHOP
WASHR'M
ELEC. CLOSET
TOWER SEMINAR ROOM

SECOND LEVEL

FIGURE 1

The first floor of the Tower Building contained the service areas, and was also the exit level for the west exit stairwell (Stair A). When the Tower Building was built, the second floor contained the typical core area as described above, with a gift shop located in the corridor near the passenger elevator lobby.

Two years after the Tower Building was built, the Tower Room was added at the second level of the building (Figure 1). This Room was designed for assembly purposes, and an exit door was installed which allowed the service corridor to be used as a passageway for persons using the Tower Room. Sometime later, an electrical closet was built in the Tower Room. Neither the Tower Room nor the electrical closet met the building regulations in force in North York at the time of construction. Combustible materials were used, and the electrical closet did not contain a smoke or heat detector.


GUEST ROOM
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STAIR A
ELEVATOR
CORRIDOR
GUEST ROOM
GUEST ROOM
GUEST ROOM
GUEST ROOM
GUEST ROOM

TYPICAL FLOOR PLAN

FIGURE 2

Above the second level, the Tower Building had 19 levels containing guest bedrooms. The hotel did not have a designated 13th floor. Each guest floor was hexagonal in shape, with a ring corridor on each floor, arranged around the typical core area. The outer area housed bedrooms with windows for each bedroom on the perimeter exterior walls (Figure 2). There were two bedrooms to each side of the hexagon. Each pair of bedrooms was serviced by a vertical shaft which contained washroom exhaust ducts, electrical wiring, plumbing and piping. There were six shafts in all. These shafts began at the roof and all of them terminated in the ceiling space above the second floor level. At the time of the fire, the bottom openings of these shafts were not properly fire stopped. Four of them were inadequately sealed, and two of them had no fire stopping of any description.

Chronology:

On January 17, 1981, at approximately 2:15 a.m., a fire broke out in the electrical closet located in the Tower Room. A vacuum cleaner had been stored in that closet, and it is presumed that a cigarette which had been picked up by the vacuum cleaner approximately seven hours earlier, smoldered until the vacuum cleaner bag broke and the contents spilled out and flared up. The flames from the vacuum cleaner bag and the contents spread to the wood panelling in the electrical closet. The electrical wiring in the closet was also set on fire. The fire broke into the washroom and the Tower Room.

The fire in the Tower Room spread to the curtains that surrounded the room and as the curtains burned, they fell to the floor, setting the carpet and furniture in the room on fire. The room was surrounded by glass on three sides, much of the glass facing the outside. Part of the glass wall divided the Tower Room from a corridor which connected the Tower Building to other parts of the hotel complex. The heat in the Tower Room continued to build until the glass broke. This caused an inrush of fresh air and aided the fire in spreading out of the Tower Room and into the corridor. From there it continued to spread until it engulfed the gift shop and the passenger elevator lobby in flames.

The entrance doorway to the Tower Room had been left open by cleaning staff. Fire spread from the Tower Room through the open entrance doorway to the service corridor. The fire was contained in this corridor by a sprinkler system.

Smoke Migration:

At the time of the fire, the exterior temperature was 5°F, and the wind velocity was 11 to 13 miles per hour. The exterior temperature was sufficiently cold to create "stack action" in the building.

The observations of smoke movement patterns made after the fire indicated that the shafts which contributed most significantly to smoke movement throughout the building were the passenger elevator shafts, the west stairwell (Stair A), and the open service shafts. Each of these shafts behaved differently during the fire, since they were subject to different pressure conditions.

The passenger elevator shaft was vented at the top and should have behaved as a top-vented shaft, thus causing smoke to move up the shaft and out the top of the building. However, the doors to two elevator cars were open at the fire floor at the time of the fire. This means that the openings at the bottom of the shaft were larger than those at the top. This created a condition more like a bottom-vented shaft and therefore all the smoke was not able to go out the top vent. Smoke moved through the elevator shaft to the floor areas between the 6th floor and the 22nd level. The contamination was greatest at the higher floor levels, where the smoke moved from the elevator shafts to the corridors and from there to the rooms. The elevator shaft was the major path of smoke migration throughout the building.

The west stairwell (Stair A) was accidentally vented to the exterior when the door to the roof was opened by hotel guests. This created a top-vented shaft. The smoke migration into the west stairwell was affected not only by the opening of the door to the roof, but also by the breaking of the windows or glass walls in the Tower Room which increased the stack action in the building. The door to the west stairwell was not equipped with latching hardware and therefore was not able to withstand the forces created by stack action during the fire. This pressure caused the door to open, and smoke moved through that doorway and filled the stairwell. Four people died in this stairwell as a result of smoke inhalation.

Smoke barrier doors across the service corridor on the fire floor allowed the protected portion of the corridor to remain relatively smoke free.

Smoke movement in vertical service shafts, particularly those that were not fire stopped, was also affected by stack action. Smoke travelled up the vertical shafts and entered the guest bedrooms through connecting horizontal shafts for piping and electrical wiring in the bathrooms.

Detection:

At the time of the fire, the Inn on the Park had two fire alarm systems, one installed in the Tower Building and the other in another section of the building known as the low/highrise building. It should be noted that existence of two fire alarm systems was a violation of the *Hotel Fire Safety Act*.

The fire alarm system in the Tower Building was a single-stage, zoned, general evacuation type. This means that the activation of any initiating device (manual pull station, smoke detector or sprinkler) resulted in a general signal throughout the Tower Building. The activation of the fire alarm also caused any fire doors which had hold-open devices to close automatically and an alarm signal to be activated in the area of the main desk. Finally, the location of the initiating device would be identified because a signal would appear on the annunciator panels located in three places in the hotel. The three fire alarm annunciator panels were located:

1. At the main entrance of the Tower Building, second floor level.
2. Main registration desk in the south entrance.
3. The telephone switchboard room on the second level of the low/highrise building.

All annunciator panels contained a trouble light, and two of them were provided with an audible trouble signal. The visual and audible trouble signals were meant to operate if there was a system fault or if the fire alarm was initiated. The audible trouble signal could only be silenced by using a switch which was located in the fire alarm control panel in the boiler room.

Combination heat detectors (rate of rise and fixed temperature type) were installed in a number of areas in the Tower Building, including the guest rooms, storage areas, service elevator lobbies, gift shop and the Tower Room. Fixed temperature heat detectors were installed in a number of other areas. In addition, smoke detectors of the ionization type were located in the main corridors on Floors 2 to 22 in addition to other areas of the building. The heat detectors and smoke detectors were electrically connected to the fire alarm system.

There was no direct connection of the fire alarm system to the fire department.

Fire Alarm System — How Did the System Operate?

Even though the Tower Room was equipped with heat detectors, the alarm system was initiated by smoke detectors located outside the Tower Room. The heat detectors in the Tower Room did fuse, but the alarm system failed to sound.

The failure of the fire alarm system was the subject of an investigation. The Tower Room was added to the original Tower Building two years after construction. When the heat detectors were installed in the Tower Room, the wiring for the detectors was located in a conduit which was mounted on the wall of the Tower Room and in the electrical closet where the fire originated. Although the heat detectors fused, the fire alarm was not activated because the fire in the electrical room burned the wiring between the detectors and the fire alarm control panel. As a result, the fire alarm control panel did not receive the signal from the detectors in the Tower Room.

The fire alarm was eventually initiated by smoke detectors. It sounded throughout the Tower Building, but due to inadequate maintenance, a number of the bells failed to sound. The second alarm system in the low/highrise portion of the building did not operate.

When the alarm sounded, the night manager identified the location of the initiating device by looking at the annunciator panel at the Front Desk. He went to the fire alarm control panel in the boiler room and shut off the alarm. He then went to investigate if there was, in fact, a fire.

After confirming that there was a fire, he returned to the boiler room to reactivate the alarm system. The alarm operated for three or four minutes and then stopped. Further attempts to reactivate the alarm system were unsuccessful. Only then was a call placed to the fire department.

Egress (Guest and Staff Action):

The Tower Building was not equipped with a voice communication system. The only way for hotel staff to communicate with guests was through the use of the telephone. However, the staff found that the telephones were inoperative because of a time device which shut down almost all telephones in the Tower Complex at 2 a.m. Only the switchboard operator and room service were able to communicate with the guestrooms. Guests who contacted the switchboard operators were given conflicting advice. Some were told to stay in their rooms while others were told to leave their bedrooms and evacuate by the stairs.

Some guests followed the west stairwell (Stair A) to its exit level on the first floor. At the bottom of that stair shaft, they encountered a short passageway. There was no indication that this was in fact an exit. Therefore, these persons turned back and re-entered the west stairwell in attempts to escape from the building.

In some cases, hotel staff failed to follow emergency procedures which were prescribed in the evacuation plan. For instance, it was contrary to instructions to turn off the fire alarm system before verifying the existence of a fire. In other cases, while the evacuation plan was followed, the instructions in the plan were not in accordance with general fire safety principles. For example, it is not considered good practice to verify the existence of a fire before calling the fire department. Further, there were two evacuation plans in existence and there was confusion as to which one prevailed.

The deaths which occurred were due to smoke inhalation. Four of the deceased died in the west stairwell trying to escape from the fire. Two others died on the 22nd floor of the hotel, one in a guestroom and one in the corridor. Sixty-seven persons were injured.

Results:

An inquest was held after the Inn on the Park fire and extensive recommendations were made (Exhibit 40). Those recommendations were directed towards fire departments, regulatory agencies, the hotel industry, and other recommendations were classified as "general".

The evidence during the Inquiry demonstrated that the large majority of the recommendations made by the Coroner's Jury have been acted upon. The jury recommended the enactment of an Ontario Fire Code, and that the Ontario Fire Marshal review and approve emergency procedures for evacuation for all hotels. These two recommendations have been met by the passage of the Ontario Fire Code and by the extensive program being implemented for hotels through the Hotel Fire Safety Services Unit of the Office of the Fire Marshal.

For a complete text of the recommendations and a description of the action taken in response thereto, see Volume 2, Part B.

Significant Findings and Conclusions Arising from this Fire:

1. Smoking materials were the most probable source of ignition.
2. Failure to comply with building by-laws resulted in inadequate detection.
3. Open service shafts resulted in increased avenues for smoke migration.

4. Delay in notifying the fire department allowed the fire to grow.
5. There were inadequate exit signs.
6. Building contents, primarily furniture, had a significant effect on the heat of the fire.
7. A product of combustion detector was not installed in the electrical closet in the room of fire origin. No application was made for a building permit to construct the electrical room, and the building by-law which required the installation of a detection device was not complied with.
8. People went to the roof after forcing the door to the roof. The door was left open, creating a top-vented shaft.
9. Improper maintenance resulted in the failure of some alarm bells.
10. Some hotel staff did not follow pre-fire instructions. In other cases, instructions given to hotel staff were not in accordance with accepted fire safety principles.
11. The inspection authorities did not discover breaches of the building by-law at the time of construction which had an effect on the outcome of the fire. In addition, inspectors under the *Hotel Fire Safety Act* did not note deficiencies after construction.
12. The passenger elevator shaft was a prime avenue for smoke migration.
13. Hotel guests received conflicting information from hotel staff and were confused as to what they should do.
14. Outside temperature had a significant effect on stack action in the building.

MGM Grand Hotel:

The MGM Grand Hotel is a highrise building located in Las Vegas, Nevada. A fire occurred in the "Deli Restaurant" on the ground floor in the early morning of November 21, 1980.

Like the Inn on the Park, the MGM Grand Hotel is an atypical structure. For that reason, I include a detailed description of the building. Information about this fire is drawn primarily from reports made for the National Fire Protection Association, (NFPA) which describe the building as it was at the time of the fire.[5]

Description of the Building:

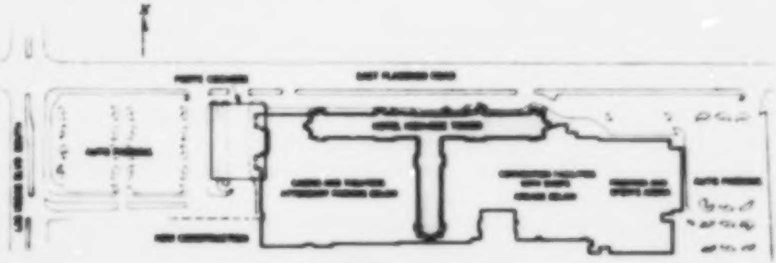


FIGURE 3

The MGM Grand Hotel was built in the early 1970's and consists of 21 storeys of guest rooms, situated above a large, ground-level complex. This large, lowrise complex contained a Casino, showrooms, convention facilities, Jai Alai Fronton, and stores. Figure 3 is a site plan of the entire complex, which was of mixed construction. The highrise portion was fire resistive, while the lowrise consisted of both protected and unprotected, non-combustible construction. Figure 4 shows the main floor Casino area, theatres and restaurants.

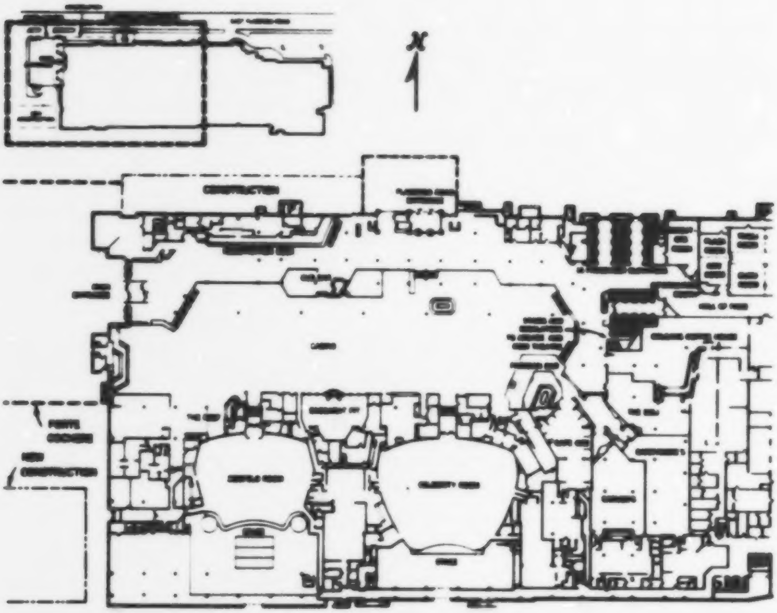


FIGURE 4

The Casino was 68,000 square feet in area. In addition, the Casino level contained a number of restaurants which were located in the east and southeast part of that floor. The fire, which began in the Deli Restaurant, spread into the Casino area. The Deli Restaurant was about 3500 square feet in area and was furnished with free-standing chairs and wrap-around booths which were made of polyurethane foam covered with vinyl material. The Casino furnishings included gambling tables and other furnishings which were primarily plastic materials. The space above the dropped ceiling of the Casino contained a fuel load in the form of plastic insulation on electrical wiring.

Portions of the Casino level of the building were protected with automatic sprinklers. The main Casino, the Deli and The Orleans Coffee House were not protected with automatic sprinklers.

The guest rooms were contained in the highrise portion of the hotel. The guest room tower was a fairly typical double-loaded corridor arrangement; that is, it had a central corridor with guest rooms on either side. The guest floors were served by six stairways, with two stairways serving each of three wings. Each wing had a pressurized stairwell (smoke-proof tower) at the end of the wing and an interior stairway located approximately ⅓ of the distance from the elevator lobby to the end of the wing. These stairs were equipped with illuminated exit signs. There were signs on the doors stating: "EMERGENCY FIRE EXIT ONLY, NO ACCESS TO OTHER FLOORS."

It was possible to open the stairwell door from the guest floors and enter the stairwell. Once a person had done this, however, the self-closing doors locked to prevent return to the corridor or entry to other floor levels. Anyone entering the stairway was expected to travel down the stairs to ground level, and walk along an enclosed passageway to the outside of the building. Some of these passageways were over 100 feet in length. These stairwells also led to the roof. However, doors to the roof were locked.

The MGM Grand Hotel had four systems for heating, ventilation and air conditioning (HVAC). The entire area over the Casino ceiling was one plenum without fire walls or fire dampers. A plenum is a compartment which forms part of the air distribution system. Therefore, the space above the dropped ceiling over the Casino was used as part of the HVAC System for air recirculation. Because it was not separated by fire walls or protected with fire dampers, contaminated air got into this plenum and was circulated throughout the hotel.

Conditioned air was also supplied to the corridors and elevator lobbies of the guest room floors from air handling units located on the roof. This air was supplied to each floor by way of shafts, and then through large, vertical, adjustable-volume air transfer grill assemblies which were equipped with fire dampers. Make-up air for the guest rooms was provided from the corridor through grills installed in the corridor walls above the door to each room. These grills were equipped with fusable link-operated fire dampers. Air also travelled from the corridors into guest rooms through enclosed ducts to fan coil units in the rooms.

There were several vertical shafts that contained ducts for toilet exhaust from the guest bathrooms and for wiring.

Chronology:

An investigation by the Clark County Fire Department concluded that the most probable source of ignition in this fire was heat produced from an electrical short circuit. There was a flexible metal conduit containing an ungrounded conductor wire in a concealed space in a pie-case in the waitresses' serving station on the south wall of the Deli Restaurant. The investigators believed that, over a long period of time, the heat produced from this short circuit raised the temperature of the combustible materials around the pie-case to the ignition point. The pie-case was enclosed in plywood, and this plywood was concluded to be the material first ignited. The fire most likely smoldered for a period of time before breaking out of the concealed space and into the waitresses' serving station. This happened at approximately 7:05 to 7:10 a.m. on the morning of November 21, 1980, when the Deli Restaurant was closed.

From the serving station, the fire spread by way of lightweight fuels such as plastic, paper, and combustible interior finishes such as wallpaper. The smoke produced from this fire moved directly from the serving station through an air transfer grill into the plenum above the ceiling and then into the air handling systems.

The entire serving station and then the Deli Restaurant itself were engulfed in flames. Eventually, the fire vented through the front doors of the Deli. Those doors had been closed during the early stages of the fire, but were opened by an employee when he attempted to extinguish the fire. The fire also breached the wall separating the Deli from the adjoining coffee shop, The Orleans Coffee House. The fire then swept from both areas into the Casino.

Virtually all of the furnishings and other contents of the Casino (including the "crystal chandeliers") were made of plastic materials.

The presence of this fuel load, the air supply and a very large undivided area allowed for extremely rapid fire spread and heavy smoke production. It is the belief of the investigators that a "flashover" took place at this time.

> "Flashover is when there is an excessive build up of heat and gases from the fire itself, and all combustible materials are heated to their ignition temperature, simultaneous ignition occurs, and the area becomes fully involved in fire."[6]

Within six minutes of the time of discovery, the total Casino area was involved in the fire. The fire blew out the west doors of the Casino, thus involving the canopy area (Porte Cochere) outside the building. This area was fully involved with the fire by 7:25 a.m.

Even though the entire Casino to the west of the fire origin became involved, the fire was very effectively stopped in sprinklered areas to the south and east.

Smoke Migration:

> "As the fire grew in the Deli and then the Casino, large amounts of smoke spread through the plenum above the ceilings along with a great deal of heat. This fire development resulted in the failure of a suspended ceiling system between the Casino and the "Eye in the Sky" security walkway system. Several unprotected vertical openings and vertical openings with enclosure deficiencies allowed the spread of heat and smoke to the highrise tower. These vertical openings included seismic joints [used in areas which experience earthquakes], interior stairways and smokeproof stair enclosures, toilet exhaust shafts, and other building service penetrations such as pipe chases."[7]

The passenger elevator hoistways provided a major avenue for smoke and heat spread in this fire. The location of nine elevators, some with open doors, on or near the Casino level and the failure of hoist ropes on two elevators allowing the cars to drop below the Casino level floor, created open hoistways for smoke and heat to travel upward. Heat and smoke spread out onto guest room floors from the hoistway shafts.

Unprotected vertical openings terminated in a plenum area above the 26th floor ceiling. Heat and smoke spread to this plenum and subsequently to the mechanical penthouse located on the roof.

The air handling units, which supplied conditioned air down the shaft to the corridors of the highrise portions of the building, were not equipped with smoke detectors designed to shut down the system upon detection of smoke. As a result, the units continued to operate, taking the smoke-laden air within the mechanical penthouse through their filters and continuing to pump it back through shafts into the corridors of the guestroom portions of the hotel.

The fan coil units for the individual guest rooms, as previously described, took their makeup air from corridors. Depending on pressure differentials between the corridors and the guest rooms and whether or not the fan-coil unit was in operation, smoke in varying degrees migrated into guest rooms.

Smoke which was travelling vertically in some toilet ventilation systems overpowered the exhaust capacity of the system and leaked into bathrooms.

Detection:

For the purpose of this report, it is not necessary to describe the fire alarm system in the MGM Grand Hotel in detail. There were no reports of any fire alarm signals sounded during the entire fire incident. However, in the early stages of the fire, according to statements by hotel staff, announcements were made over the public address system to evacuate the Casino only.

The fire alarm system had a pre-signal feature. A general evacuation alarm would not sound in the building unless the system was manually activated by hotel staff. If an alarm initiation device (manual pull station, detector or sprinkler) was activated, it would transmit a signal to the fire alarm annunciator panels. Hotel security personnel would then be sent to investigate the source of the alarm. In addition, the alarm signal was automatically transmitted to a central station outside the hotel. However, the central station personnel would not telephone the fire department until *after* an initial five minute delay, and then only if the MGM Grand system had not been reset by hotel staff, or if the existence of a fire was confirmed to the central station by telephone.

No one activated the general alarm to alert guests. Further, the existence of a pre-signal feature was a contributing factor in the failure to notify guests. This problem also arose in the next fire studied, the Westchase Hilton in Houston, Texas.

Suppression and Rescue:

The fire service operations are described in the NFPA report (Exhibit 184). The fire department was notified by telephone at 7:16 a.m., and the initial response was made within minutes.

Although only spot fires were reported by 10:30 a.m., fire department personnel were at the fire scene until approximately 9 p.m., conducting searches and removing victims from the building.

An estimated 300 persons were evacuated from the roof with another 12 persons rescued from balconies by helicopter.

Egress (Guest & Staff Action):

> "The high-rise tower evacuation alarm system apparently did not sound and most guests in the high-rise were alerted to the fire when they heard or saw fire apparatus, saw or smelled smoke, or heard people yelling or knocking on doors. Many occupants were able to exit unassisted down stairs. Others were turned back by smoke and sought refuge in rooms. Many broke windows to signal rescuers or to get fresh air."[8]

As a separate research project, a human behaviour study of the hotel occupants was conducted for NFPA to examine and analyze the dynamics of the human behaviour in the MGM Grand Hotel fire. The principal investigator for the study was Dr. John L. Bryan, Professor and Chairman, Department of Fire Protection Engineering, University of Maryland. Dr. Bryan appeared as a witness at this Inquiry and his evidence included a review of the report prepared as a result of that human behaviour study (Exhibit 183). Some significant findings of the human behaviour study are discussed in Chapter 14.

At the time of the fire, the MGM Grand Hotel had some 3400 registered guests in the highrise tower and patrons on the Casino level in addition to employees throughout the building complex. Eighty-five people died in this fire and some 600 persons were injured and required medical attention. It was the second largest loss of life hotel fire in the United States.

Results:

As a result of the fire at the MGM Grand Hotel, the Governor of Nevada appointed a nine-man Commission to review possible improvements to existing codes for fire and life safety. A report entitled "Governor's Commission on Fire Safety Codes" dated March 11, 1981, was prepared by that Commission (Exhibit 24).

Following that report, the State of Nevada passed Bill 214 which was legislation providing for the retrofitting of buildings, including highrise buildings, to improve fire and life safety (Exhibit 193, 193A). An outline of that law is found in Chapter 10.

Significant Findings and Conclusions Arising from this Fire:

1. The fire demonstrated the effect of uncontrolled fire in large open spaces, and the value of sprinklers in preventing the spread of such fire.
2. The interior finishes and furniture had a significant effect on the spread of fire and products of combustion.
3. Stairwell doors which were locked from the inside trapped approximately 50 guests until a roof access door was opened. Had that door not been opened, approximately 50 more people may have perished.
4. Improper construction practices provided avenues for smoke migration.
5. The elevator shaft was a prime avenue of smoke migration.
6. Delay in notifying the fire department permitted the fire to grow before suppression forces arrived.
7. There was no notification of guests by fire alarm.
8. Hotel guests were confused as to what to do.

The Westchase Hilton:

On March 6, 1982, a fire occurred in the Westchase Hilton Hotel in Houston, Texas. The information about this fire is drawn from the report of an investigation conducted by the National Fire Protection Association, and describes the building at the time of the fire.[9]

Description of the Building:

The Westchase Hilton Hotel complex consisted of three separate areas of varying height and construction. A 13-storey highrise tower contained 306 guest rooms, with typical hall corridors dividing guest rooms on both sides of the corridor, elevators in the centre of the corridor, with exit stairwells at each end of the 182 foot corridor. The stairwell closest to the room of fire origin was a pressurized stairwell (smoke-proof tower), while the other stairwell was not pressurized. The exit doors for the stairwells were located at each end of the corridors in small foyer areas which also contained storage rooms. The doors to the storage rooms were similar in appearance to the doors to the stairwells. An illuminated exit sign was placed at the junction of the corridor and the foyer, but there were no additional markings to distinguish the exit door from the storage room door. The storage room doors were locked.

The Westchase Hilton was a new hotel, having been built in accordance with the City of Houston's building code and opened for business in late 1980. The guest rooms were divided by fire resistive construction. Doors between the guest rooms and the corridor were 1¾ inch solid core doors. These doors had self-closing devices.

Chronology:

The fire began in a guest room on the 4th floor of the hotel, and was probably caused by a cigarette igniting an upholstered chair. According to tests conducted after the fire, a cigarette would smoulder for approximately one hour on this type of chair before the chair burst into flame. While there were two occupants registered in the room, only one of the guests was in the room at the time of ignition.

A guest who was registered on the 8th floor in a suite served by the same vertical service shaft as the room of fire origin, returned to her room at 2:10 a.m. She found the room filled with smoke. She opened the door to her suite, hoping to clear the smoke, and telephoned the hotel operator. The smoke detector in the 8th floor corridor activated and transmitted a signal to the annunciator panel located adjacent to the front desk. It appears that the smoke detector in the 4th floor corridor did not activate. A hotel security guard visited the 8th floor guest room to investigate the smokey conditions which had been reported by the guest. The guard concluded that the smoke was entering the room through the ventilation system. This guest then left the building after telephoning the hotel operator again. The guest later reported that she suggested to both the guard and the hotel operator that the other guests should be alerted. Neither of them took steps to do so. The hotel fire alarm system was not sounded at that time.

At approximately 2:20 a.m., the second guest registered in the room of fire origin returned to the room. He opened the door, and observed that the room was filled with smoke. He located the fire which he unsuccessfully attempted to extinguish. He searched for and ultimately located his semi-conscious roommate and pulled him into the corridor. He then assisted his roommate out of the building. Although it was equipped with a door closer, the door to the room of origin remained partly open. The door was not closed by the hotel guest.

A person who had accompanied this guest on his return to the hotel reported the fire to hotel staff. The hotel desk clerk then called the fire department at about 2:25 a.m., and the first fire department dispatch took place at 2:27 a.m.

Upon arrival at the fire scene, fire department personnel observed fire rolling out of the room windows on the 4th floor. The District Fire Chief entered the building. He reported that he heard no fire evacuation alarm sounding and said that there were very few occupants on the ground floor corridor or in the stairways attempting to exit the building. He concluded that the guests had not been alerted about the serious fire emergency.

Due to the external building configuration, the fire spread horizontally along the outside of the building to adjoining rooms on the 4th floor, and there was some vertical exterior extension of the flames.

Smoke Migration:

Before the fire was discovered by the second guest registered in the room of fire origin, smoke was already moving through the bathroom vent system or through the fan coil unit which was located in the vertical pipe chase in the common wall between the bathrooms of the room of fire origin and the adjacent suite. For this reason, guests in rooms served by the same bathroom exhaust as the room of fire origin were the first to be aware of smoke.

After he discovered the fire and rescued his roommate, the second guest failed to close the door to the room of fire origin. The self-closing device on that door did not operate properly, most likely due to interference by the carpeting.

Smoke from the fire moved into the 4th floor corridor through the partly opened door, and conditions in the corridor rapidly became untenable. There was some flame spread from the room of fire origin into the corridor, but it was limited to the immediate vicinity of the room of fire origin. The corridor became very hot, and smoke conditions were so severe that the other occupants of the 4th floor who tried to escape had to guide themselves by feeling the corridor walls in order to reach the stairwell.

Smoke continued to move from the 4th floor corridor to upper floors. The primary avenues of smoke migration were the elevator shafts and the HVAC

System. Occupants of upper floors reported that smoke came out of the elevator shaft and filled the corridors.

At an early stage in the fire, the 4th floor door to the unpressurized stairwell had been propped open with a chair. This allowed smoke to enter that stairwell and to migrate vertically to upper levels. Some occupants from upper floors found that they could not use this stairwell because of the smoke. Smoke was also reported within the pressurized stairwell. This was probably the result of fire department operations.

Detection:

The fire alarm system in the Westchase Hilton was designed so that after a signal was received from an initiating device, such as a smoke detector, there would be an alarm at the annunciator panel. This pre-signal feature was set for three minutes to allow for investigation of the alarm source. If the pre-signal was not cancelled within three minutes, an evacuation alarm would sound on the floor where the initiating signal came from, and on the floors immediately above and below that floor. This type of "zoned alarm" is based on the assumption that the initiating device will be located on the fire floor.

A key-operated switch was provided at the annunciator panel. It was necessary to operate this switch before a general evacuation alarm would sound throughout the building.

Upon initiation, the fire alarm system was also designed to shutdown the HVAC System, return elevators to the first floor lobby area, and activate the pressurization system in the one pressurized stairway. The evacuation signal was a combination of horns and strobe lights.

There was no direct connection from the fire alarm system to the fire department.

Although a smoke detector on the 8th floor *did* cause the pre-signal feature to operate, the desk clerk on duty repeatedly cancelled the signal. This action silenced the annunciator panel alarm and prevented the zoned evacuation alarm from sounding in the highrise tower. It appears that the general alarm signal did not sound at any time. This was either because the switch for the general alarm signal was never turned on, or because the whole system failed when a large number of initiating devices activated at once.

Guest rooms were equipped with smoke detectors of the single-station, battery operated ionization type. These detectors were meant to alert occupants of individual guestrooms of smoke in the room. They were not electrically connected to the fire alarm system. In some rooms, smoke detectors failed to operate. Tests performed on the units by NFPA showed no malfunction of these smoke detectors. NFPA suggested that the failure of some of these detectors may have been due to the poor location of the detector in the room or the "cold smoke effect".

As smoke travels away from a fire it ages, and the small particles cluster together, decreasing the number of particles in the air and increasing the size of the particles. It has been suggested that this process can have a detrimental effect if one is relying on a smoke detector of the ionization type. This phenomenon is known as the "cold smoke effect".

In some cases, the smoke detectors were located in a small foyer area within the suite. In these cases, smoke may have entered through cracks around the door and been drawn directly across to the fan coil unit without entering the foyer.

Suppression and Rescue:

When the Fire Department arrived at the hotel, the key for the firefighter's elevator could not be located. This did not have a significant effect on suppression as the fire was on the 4th floor rather than on a higher floor. After running a fire hose from the 3rd floor standpipe up the stairwell to the 4th floor, the fire department quickly extinguished the fire.

Search and rescue operations were commenced as additional fire department companies arrived at the hotel. Search of the fire floor was delayed because no master key for the 4th floor could be found by hotel staff. Firefighters had to perform forcible entry to each 4th floor guest room. Some guests on the 4th floor were rescued through broken windows by ground or aerial ladders. On upper floors, some guests had been trapped in their rooms. Approximately one dozen people had been taken to the roof by a member of the hotel maintenance staff. These people were subsequently taken down the stairwell by the fire service.

Egress (Guest and Staff Action):

There were 62 guests occupying the 4th floor of the Westchase Hilton. Ten of these guests died at the fire scene, while two others died subsequently in hospital.

Surviving occupants of the 4th floor reported that they were awakened by yelling or by rumbling and crashing noises. In many cases, the guests opened their doors to investigate. A few of these guests were able to escape, but as conditions deteriorated, most found that they were trapped in their rooms. Some took defensive action within their rooms, for example, placing wet towels around doorways or alerting the fire department of their presence. Some attempted to break the glass windows by various means.

Occupants of other floors also found that smoke had spread into hotel corridors or exit stairways before they could attempt to escape. The NFPA report states that:

> "successful escape efforts of occupants depended on several factors:
>
> — the time frame within the fire scenario in which they became aware of fire conditions and attempted to initiate their escape;
> — the floor on which they were located;
> — the escape route they attempted to use; i.e., stairways, etc.
> — instructions given by hotel staff to occupants who called the front desk; and
> — occupants being located by firefighters and assisted/removed from the hotel.
>
> The initial course of action of many occupants was to call the hotel operator or the front desk to either ascertain what was going on in the hotel, or to seek guidance and direction as to what they should do. This indicated an inherent reliance of the hotel guests on the hotel management to instruct them on what to do in a fire emergency."[10]

While occupants were aware that they should not use elevators as a means of escape, some occupants did use the service elevator when they found that one or both of the hotel stairways were untenable.

The absence of exit markings and the similarity of exit doors and adjacent storage room doors were a source of confusion to some occupants.

The Houston Fire Marshal's Office requires all hotels to have an approved fire emergency plan. The plan for the Westchase Hilton Hotel had not yet received final acceptance by the Houston Fire Marshal, but apparently several members of the staff had received fire safety training prior to the opening of the hotel.

This fire resulted in the deaths of twelve hotel guests, all registered on the fire floor, and serious injury to three others.

Significant Findings and Conclusions Arising from this Fire:

1. The source of ignition was smoking materials.
2. There was no notification of guests by a fire alarm.
3. There was delay in notifying the fire department.
4. The door to the room of fire origin was left open and provided an avenue of smoke migration.
5. The elevator shaft and the HVAC System were prime avenues of smoke migration.
6. There were confusing exit signs.
7. Building contents had an effect on the products of combustion.
8. Hotel staff did not follow procedures.
9. Hotel guests were confused as to what to do.

STATISTICS:

If the failures illustrated by the fires discussed above are not remedied, the potential for further tragic hotel fires will continue to exist.

It would be misleading to assess fire safety in hotels by only examining a few individual spectacular fires. Neither the fires alone, nor the statistics alone, give the total picture of fire safety in hotels. Both must be considered together. I therefore believe it is appropriate to review some of the statistics.

There are approximately 2,500 highrise apartment buildings and 600 other highrise buildings in the Province of Ontario.[11] We do not know how many of the 600 are hotels. The fire statistics for *all* hotels in Ontario illustrate that for the years 1976 to 1981, inclusive, a substantial number of injuries and deaths occurred.[12] Thirty-two per cent of those injuries occurred in highrise hotels, and the greatest number of injuries occurred in 1981.[13] Deaths occurred in highrise hotels in 1980 and 1981 only. The statistics for 1981 contain the injuries and deaths from the Inn on the Park fire.

It is apparent that one fire can have a substantial impact on the overall statistics, particularly where the statistics cover a short period of time. That one fire cannot, however, be ignored or downplayed.

The statistics reveal that in all hotels 7 storeys and greater, smoking materials were the cause of approximately 35-40% of all fires during the period 1976 to 1981. Of the deaths which occurred in hotels *and* apartments 7 storeys and greater over the same period of time, 62.1% involved fires which were started because of smoking materials. In fact, all of the deaths in highrise hotels in Ontario occurred in fires which were caused by smoking materials.[14]

The fire at the Inn on the Park and the Westchase Hilton were most probably caused by smoking materials.

These statistics clearly illustrate that special care must be directed to the issue of careless use of smoking materials. Neither hotel management nor the fire department can eliminate careless smoking. The public must become more careful in their use of smoking materials. If this were accomplished, the fire record would improve substantially.[15]

HOTEL FIRE SAFETY:

History of the Hotel Fire Safety Act:

The major provincial Act governing fire safety in hotels in the Province of Ontario is the *Hotel Fire Safety Act*. That Act has a long history, commencing in 1888, with major revisions in 1937 and 1971 (Exhibit 94).

In 1971, there were major amendments to the *Hotel Fire Safety Act*. This Act and many parts of the regulations apply to all hotels regardless of when they were constructed. As a result, the *Hotel Fire Safety Act* and regulations impose many retrofit requirements on hotels. Except for the recently passed provisions of Part 9 of the Ontario Fire Code dealing with assembly occupancies, and rooming and lodging homes, there are no comprehensive retrofit requirements imposed by the Province on residential, office or mercantile occupancies.

Prior to 1981, inspection of hotels having liquor licences was done by inspectors from the Liquor License Board of Ontario (LLBO). After reviewing the jury recommendations concerning the deaths at the Inn on the Park, and at least in part as a response thereto, the Province of Ontario transferred all inspection functions under the HFSA/Regs. to the Ministry of the Solicitor General, and in particular, to the Office of the Fire Marshal. The Hotel Fire Safety Services Unit was established and given the responsibility for inspection of all hotels in the Province.

During the Inquiry, John Hess, the Chief of this Unit, testified that amendments to the *Hotel Fire Safety Act* and the regulations thereto have been proposed. He stated that those amendments should come into effect in the Fall of 1983 (Exhibit 56A). The Inquiry reviewed the proposed amendments in detail, and Mr. Hess advised the Inquiry of many changes that were made in the original proposals (Exhibit 56) as the result of matters raised during the Inquiry.

In addition to submitting the proposed amendments, Mr. Hess described for the Inquiry his mandate and activities since his appointment. He has reorganized the inspectorate, and has initiated new policies in regard to inspection of hotels, education of hotel staff, fire safety planning in hotels, and information for hotel guests. This new approach to hotel fire safety has the cooperation and support of the Ontario Hotel and Motel Association. No significant opposition exists to the new programs of the Hotel Fire Safety Services Unit. The hotel industry is particularly enthusiastic about the programs for training hotel staff and the assistance being given to them relating to fire safety plans.

Inspection:

Hotel Fire Safety Services Unit Inspectors are deployed throughout the Province of Ontario, and report to one of four district supervisors (Exhibit 93). Each inspector is responsible for 20 to 40 hotels, depending upon population density and geographical area. The inspectors have been directed to implement the new hotel inspection program developed by Mr. John Hess (Exhibit 97). The new program includes a complete audit of all existing hotels by the inspectors. The purpose of this audit procedure is to familiarize both the inspectors and the hotel owners and managers with the fire safety features of each specific hotel. Mr. Hess provided the Inquiry with an example of the completed audit of a specific hotel (Exhibit 92).

The building audit is only the first step in the ongoing inspection program for hotels. The hotel inspectors are receiving extensive training in fire safety through a program developed within the Office of the Fire Marshal. This type of training has only been given since the transfer of all inspection functions under the HFSA to the Office of the Fire Marshal. It appears to me that there is a substantial improvement in the Province in the approach to hotel fire safety since that transfer, and this view is shared by representatives of the hotel industry who appeared before the Inquiry.

The HFSA is enforced by provincial hotel inspectors. The OFC is enforced by municipal fire departments. Some witnesses voiced a concern that if hotels were not inspected by fire department personnel, the fire department would lose the benefit that is gained by inspecting buildings to which the fire department may have to respond. This was a primary concern of Chief Lyle MacLennan of the Ottawa Fire Department. On the other hand, Assistant Deputy Chief Sproule of the Toronto Fire Department testified that he was not concerned as to who had jurisdiction for assuring fire safety in hotels. He had no reason to believe that the type of inspection that would be done by the provincial inspectors under the HFSA would not be of a very high calibre. He also stated that there is no shortage of work for the municipal fire prevention officers, and any relief that those inspectors receive because of provincial inspectors going into hotels would be beneficial.

I believe this concern will be adequately met through the cooperative program being developed by Mr. Hess. It is the policy of the Hotel Fire Safety Services Unit that after their inspectors complete an inspection of any hotel, they must meet with the appropriate member of the local fire department in order to pass on any information which might be useful to the fire department. In any event, the inspection of hotels by provincial inspectors does not prevent the local fire department from visiting highrise hotels for the purpose of preparing pre-fire plans.[16]

Education:

The second matter addressed by the Hotel Fire Safety Services Unit is the provision of education programs for hotel management and staff. The Unit has produced a five-part program which is being distributed throughout the Province, and is intended to provide a comprehensive general review of fire safety for hotel staff. The program, which is now an audio-visual presentation, covers five areas: fire safety, fire prevention, fire protection, fire procedures and highrise fire safety.

Mr. Hess stressed that the final portion, that dealing with highrise fire safety, cannot be considered a separate topic, but must be viewed in the context of an understanding of fire safety generally. Mr. Hess advised the Inquiry that as of November, 1982 programs had been presented to approximately 600 hotel staff throughout the Province.

The proposed amendments to the *Hotel Fire Safety Act* will give the Lieutenant Governor in Council the power to make a regulation requiring hotels to have fire safety specialists (HFSA Section 19(y)). These specialists are most likely to be required in larger hotels such as highrise hotels. The fire safety specialists would be assigned responsibilities for overall fire safety programs within the hotels. Although hotels are not presently required to have an inhouse specialist, the Hotel Fire Safety Services Unit has designed a program for the training of persons who could fulfill this function. The first seminar for hotel fire safety specialists was held for three days in March, 1983, in Toronto. The materials prepared for that seminar were made available to the Inquiry, and cover such matters as fire prevention guidelines, fire protection, including structure and equipment, and fire safety procedures. This last topic deals with maintenance and the use of building safety features (Exhibit 291).

Mr. Hess does not believe that it is necessary to pass the regulation which would require the employment of a "fire safety specialist". It is his perception that the management of highrise hotels are cooperating in implementing the new program without being compelled to do so. Representatives of the hotel industry were pleased with the recent development in education for themselves and their staff and appear to be cooperative and interested. It is evident that Mr. Hess is very enthusiastic. His belief that the process can proceed as a joint venture by two interested groups, the Province and the hotel industry, appears well founded. In the event that the cooperation anticipated by Mr. Hess is not forthcoming, the regulation referred to above should be implemented.

Fire Safety Plans:

It is the position of the Ministry of the Solicitor General that the OFC does not apply to hotels. For that reason, a requirement for hotel owners to prepare fire safety plans, similar to those required by the OFC, is found in the proposed amendments to the HFSA. However, it appears that a certain amount of fire safety planning has been done in hotels because of the requirement in the current HFSA to have an "evacuation plan".

As a result of concern about the contents of existing evacuation plans, the Hotel Fire Safety Services Unit prepared a guideline for use by its inspectors when reviewing hotel fire safety plans (Exhibit 62). It is evident that the new approach by the HFSSU is more comprehensive than the program previously administered by the Liquor License Board of Ontario. Fire safety plans will now include much more than evacuation procedures. Mr. Hess advised the Inquiry that it is his intention that fire safety plans for hotels will meet all of the requirements for fire safety plans in the Ontario Fire Code. A detailed discussion of fire safety plans for all highrise buildings is found in Chapter 15.

Mr. Hess believes that it is important for the Provincial hotel inspector to maintain a liaison with the local fire departments. For that reason, these inspectors will be providing the local fire departments with information gained through inspection, and also through the process of developing the fire safety plan. In this way, the fire safety planning in hotels can be integrated with the pre-fire planning of the local fire department. One must keep in mind that pre-fire planning by fire departments is a wholly separate matter. Pre-fire planning will be dealt with in the Chapter 12.

Information for Hotel Guests:

Mr. Hess is concerned that hotel guests are not receiving uniform instructions as to fire prevention and proper evacuation procedures. The Hotel Fire Safety Services Unit has been addressing this matter in two ways. They have prepared signs to be posted in suites and corridors. They have also designed an information pamphlet for distribution to hotel guests.[17] The signs and pamphlets have two significant aspects. They will be uniform for all hotels. Further, they will be produced and circulated under the authority of the Office of the Fire Marshal.

Legislation:

Legislative issues arising in relation to hotels fall into three areas. First, there is the question of whether the HFSA should continue as a separate Act or be part of the consolidation of legislation that I have recommended. Second, what should be done with the proposed amendments to the *Hotel Fire Safety Act* (Exhibit 56A)? The third area involves two separate and distinct issues arising from the evidence.

Relationship between Hotel Fire Safety Act and Ontario Fire Code

An issue arose during the Inquiry as to whether the OFC applies to hotels as defined in the *Hotel Fire Safety Act*. The Office of the Fire Marshal is responsible for administering both the OFC and the *Hotel Fire Safety Act*. Mr. John Hess of that Office testified that the view of the OFM is that the OFC *does not* apply to hotels. On the other hand, a number of witnesses, and in particular, some of the Chief Fire Officials who are responsible for enforcement of the OFC stated their view that the OFC *does* apply to hotels. For example, Chief Joseph Gibson of the City of North York Fire Department testified that until legislation clearly stated that the OFC did not apply to hotels, his department would continue to apply the OFC in hotels.

In my opinion, with the qualification noted below, the OFC *does* apply to hotels. Neither the OFC nor the HFSA has a provision which excludes the application of the OFC to hotels governed by the *Hotel Fire Safety Act*. My understanding of the law in such situations is that the OFC applies to hotels, except where there is a conflict between the provisions of the OFC and the *Hotel Fire Safety Act*. In the case of such a conflict, the provisions of the more specific statute, the HFSA, apply to hotels. Having come to this conclusion, the question which arises is whether the OFC should apply to hotels, and if so, should the HFSA continue as a separate Provincial Act, or should it be consolidated with the Ontario Fire Code. The answer to this question is contained in the following recommendation.

Recommendation:

4.1 The* Hotel Fire Safety Act *should continue as a separate Act regarding fire safety, but should be consolidated with the Ontario Fire Code when Part 9 of the Ontario Fire Code contains retrofit provisions regarding hotels.

There are two reasons for recommending that the HFSA remain a separate Act for the present time. First, if the HFSA, including its retrofit provisions, were repealed before the OFC contained retrofit provisions for hotels, retrofit requirements for hotels would cease to exist in this Province. Second, the benefit of the uniform administration of fire safety for hotels, including inspections, by the OFM might be lost.

In relation to the first reason, Mr. Hess testified that because the HFSA is a retrofit document, it should not become part of the OFC until such time as Part 9 of the OFC deals with hotel occupancies. He stressed that if the HFSA is repealed, the OFC is made applicable to hotels, and no retrofit provisions for hotels are contained in Part 9 of the OFC, present retrofit requirements for hotels would cease to exist. Such a result is unacceptable and is the prime reason that I have recommended that the HFSA not be consolidated with the OFC until Part 9 of the OFC contains retrofit provisions regarding hotels.

The submissions of the City of Toronto approached the problem from a somewhat different viewpoint. The City of Toronto recommended that the HFSA should be repealed immediately, the OFC should apply to hotels, and that any concern regarding the loss of retrofit requirements could be dealt with by transferring the retrofit provisions now contained in the HFSA into Part 9 of the Ontario Fire Code. In the final analysis, this may be exactly what happens. However, it does not deal with the second reason referred to above.

According to all witnesses, including representatives of the hotel industry, the inspection of hotels has improved greatly since the Office of the Fire Marshal took over from the LLBO in 1981. Presently an extensive training program for provincial inspectors and hotel staff is being developed and administered by the Office of the Fire Marshal. In my view, repealing the HFSA at this time, as suggested by the City of Toronto, could result in the loss of the benefit of these efforts.

It is essential that, upon consolidation of the HFSA and the OFC, the benefit of the work being done by the HFSSU continue. This could be accomplished if the OFC had a provision that, in hotels, the OFC would be enforced by the Fire Marshal's Office. The reason for leaving enforcement with the OFM as opposed to transferring it to the municipal fire departments is to retain the uniformity of inspection, education and fire safety planning for this specialized occupancy. Further, there are hotels throughout the Province, many in very remote areas where there may not be qualified fire department personnel to do the inspections, let alone to undertake other fire safety programs.

When considering whether to recommend that the HFSA continue as a separate Act, I was concerned that if the OFC did not apply to hotels, the level of life safety in highrise hotels might be less than that in those buildings to which the OFC applied. It was, and still is, my view that if the HFSA is to continue as a separate Act until Part 9 of the OFC deals with retrofit, it is imperative that the HFSA contain requirements similar to the OFC relating to "checks", "inspections" and "tests" of fire safety installations. It must also contain similar requirements for fire safety plans, fire drills and fire prevention.

Mr. Hess testified one of the reasons for the proposed amendments to the HFSA is to make the "check, inspect and test" provisions of the HFSA as consistent with the OFC as possible. It is apparent on reviewing the proposed amendments to the HFSA (Exhibit 56A), that if they are enacted, this consistency of approach between the OFC and the HFSA will be achieved.[18] As long as the HFSA and the OFC remain separate pieces of legislation, regular review of the HFSA will be necessary in order to maintain consistency with future amendments of the Ontario Fire Code.

Notwithstanding the legal opinion of the Ministry of the Solicitor General that the OFC does not apply to hotels, evidence heard by the Inquiry indicates that many hotels have been the subject of duplicitous inspections and conflicting orders. Local fire departments are confused as to whether they have the duty to enforce the OFC in hotels. This creates frustration on the part of the hotel industry. If it is the intention of the Ministry of the Solicitor General that the local fire departments should not be enforcing the OFC in hotels, the legislation should so state.

Relationship between the Hotel Fire Safety Act and Ontario Building Code

Recommendation:

> **4.2** ***The Ontario Building Code should be the only legislation governing construction of hotels and Section 3 of the*** **Hotel Fire Safety Act** ***should be amended accordingly.***

The HFSA presently contains some provisions for the construction of new hotels. The OBC also applies to the construction of new hotels.

The possible conflicts between the HFSA and the OBC were listed most comprehensively in the brief of George Fleming, and particularly that portion written by Mr. Paul Meleta (Brief 78). I believe the concerns of many witnesses that such conflicts were undesirable and that the standard for construction of new hotels should be covered solely by the OBC were justified.

The intent of the proposed amendments of Section 3 of the HFSA is to have all new construction of hotels governed by the Ontario Building Code. It is my recommendation that Section 3 should be amended to give effect to that intent. Based on the proposals, such amendment will resolve all of the conflicts between the OBC and the HFSA regarding hotel construction, save and except for two matters. Those matters relate to sprinklers and two-stage fire alarms. The HFSA will require more areas to have sprinklers than the Ontario Building Code. Unlike the OBC it will require two-stage alarms to have a general evacuation alarm sound on the floor where the alarm was initiated. These two differences are discussed in Chapters 7 and 8 where sprinklers and fire alarms are dealt with in more detail.

The Proposed Amendments

Recommendation:

> ***4.3 The proposed amendments to the* Hotel Fire Safety Act *should be made with the few exceptions referred to herein.***

Mr. Hess testified that in addition to making the "check, inspect and test" provisions of the HFSA as consistent with the OFC as possible, there were two other reasons for the proposed amendments: first, to implement the recommendations of inquest juries, particularly the jury recommendations arising from the Inn on the Park fire; and second, to respond to experience in the field which indicated that certain sections were in need of amendment.

Prior to the Hearings and as part of the normal regulatory process, the Ontario Hotel and Motel Association reviewed the proposed changes to the HFSA, and submitted their comments to Mr. Hess. It is encouraging to note that through this process, many initial differences of opinion in relation to the proposed amendments were resolved. The best example of such a process was the agreement between the hotel industry and the OFM that no stairwell doors should be locked from the inside. This procedure will allow access from the stairwell to any floor during a fire if necessary to escape from smoke.

The Association was content with the amendments being proposed except for those that dealt with five specific matters:

1. The HFSA does not specifically provide that the inspector under the HFSA will be the only inspector with jurisdiction relating to fire safety in hotels. For instance, inspectors under the *Occupational Health and Safety Act* will still be able to enter a hotel and make orders relating to fire safety. In my view, this is a valid concern and I have addressed this issue in relation to all provincial legislation in Chapter 2, primarily in my recommendation regarding consolidation of legislation.
2. The Association is concerned about the proposed amendments which will require all flaming dishes to be prepared at tableside.[19] It was their view that the number of problems that have been encountered as a result of flaming dishes being carried from kitchens to guest tables have been minimal if not nonexistent. In view of the earlier expressed cooperation between Mr. Hess and the Association, I believe this problem can be solved by them.
3. The Association does not agree with the proposed amendment which requires the ganging of chairs.[20] The Association believes that the ganging

of chairs can constitute a fire hazard and is also more expensive because ganging chairs is more labour intensive than arranging individual chairs. In a fire emergency, it is important to minimize possible impediments to a smooth and effective exit. It is my view that the ganging of chairs in large assembly areas will provide a much better chance of the space between rows of seats being maintained, if evacuation is necessary, than would be the case if chairs were not ganged.

4. In some older hotels, there are dead-end corridors that are too long by present-day safety standards. The proposed amendments impose retrofit requirements where dead-end corridors do not comply with certain specifications.[21] The Association is concerned that this provision will create an economic hardship on hotel owners. It was their view that such conditions should be resolved on an *individual basis*, and the person making the order should consider the cost of making appropriate structural changes.

   Such a discretion is provided for in the proposed amendments with which I agree.

5. The Association is concerned about the impact of retrofitting sprinklers as required under Section 44 of the proposed amendments. The Association questions the necessity for retrofitting sprinklers in *all* the areas being proposed. It is my view that it is essential for all the proposed areas to be sprinklered.

   Section 44(2) of the proposed amendments states:

   > Notwithstanding Section (1) an approved smoke control system designed to limit smoke spread from the subsidiary occupancy floor areas to the residential floor areas may be acceptable in lieu of automatic sprinklers.

In my view, the existence of a smoke control system should not be accepted in lieu of automatic sprinklers as required under Section 44(1). The fires at the Inn on the Park and the MGM Grand Hotel were uncontrolled fires in large open areas. This had a significant effect on injury and loss of life.

In Chapter 7 there is a more detailed discussion of the need for sprinklers.

The Association is particularly concerned about the expense of having to comply with this requirement by September 1, 1985, the deadline contained in the proposed amendments. [22] I do not know if this proposed date will be the actual date contained in the amendments as filed. I believe the cooperation between Mr. Hess and the industry can extend to this issue, to allow the choosing of an appropriate date. I do not by this suggestion sanction any considerable delay for this necessary retrofit.

Other Legislative Issues:

Recommendation:

4.4 The proposed amendment of the definition of "hotel" should be enacted.

The renting of apartment suites in apartment buildings to the travelling public was the subject of complaint by representatives of the hotel industry. I believe their motivation was primarily financial. I suggest, however, that if these buildings are actually being used as hotels and do not comply with the requirements of the HFSA, a more serious concern arises. The concern is that the

HFSA may not be complied with, and the level of life safety in those buildings may therefore be inadequate.

Although a highrise apartment/hotel might not have all the characteristics of a "normal" highrise hotel, the transient nature of the guests is, in my view, sufficient reason to impose the requirements of the HFSA on such buildings.

The Inquiry was advised that certain highrise apartments are now being rented by the day or week as furnished accommodation. The Inquiry was further advised that the reason for this method of rental is to avoid the controls found in the *Residential Tenancies Act*. This is not an issue for this Inquiry. My observation pertains to fire safety. If the owners wish to operate within the framework of the "apartment/hotel" then they should be regulated by the *Hotel Fire Safety Act*.

Recommendation:

> ***4.5 The* Hotel Fire Safety Act *should be amended to permit the Fire Marshal in conjunction with the Chief Building Official, to order the relocation or removal of manual pull stations where, in their discretion, such action is necessary to deal adequately with any high incidence of false alarms in a hotel.***

In Chapter 8 (Recommendations 8.6 and 8.7) I make a similar recommendation regarding the OBC and the Ontario Fire Code. The appropriate official to make this decision in conjunction with the Chief Building Official is the Fire Marshal.

[1] Brief 25.

[2] Exhibits 6, 8, 10, 16 to 20.

[3] i.e. Westchase Hilton and Inn on the Park fires.

[4] Exhibit 39A to F, Exhibits 40, 41, 60, 61, 66; see also evidence of Antonio Chow, Transcript, Volume 5, pp. 6 to 105; Joseph Gibson, Transcript, Volume 9, pp. 7 to 10; John Hess, Transcript, Volume 11, pp. 31 to 92;

[5] Exhibits 22, 24, 183 and 184; Evidence of Dr. John L. Bryan, Transcript, Volume 40, pp. 21 to 49.

[6] Clark County Fire Department, *Official Findings of the Fire that Occurred at the MGM Grand Hotel in Las Vegas, Nevada*, p. V-17.

[7] Exhibit 184, pp. 38 to 39.

[8] Exhibit 184, pp. 38 to 39.

[9] Exhibit 278.

[10] Exhibit 278, p. 33.

[11] Exhibit 4 and 4A.

[12] Exhibit 6.

[13] This figure calculated from a comparison of the figures in Exhibits 6 and 8.

[14] Exhibits 10 and 11.

[15] Other statistics relating to hotel and motel fires are contained in Exhibit 235, Appendix E, p. 3. Other statistics are also found in the Fire Marshal's Statistics.

[16] See also MacLennan at Transcript, Volume 30, pp. 43, 77, and Sproule at Transcript, Volume 44, pp. 18, 20.

[17] Exhibits 292, 293 and 294.

[18] Exhibit 58.

[19] Transcript, Volume 16, p. 35.

[20] Transcript, Volume 16, pp. 50 to 51.

[21] Exhibit 56A, Regulation Section 19(2).

[22] Transcript, Volume 16, p. 91.

Chapter 5

Office Buildings

INTRODUCTION

The Canadian Institute of Public Real Estate Companies (CIPREC) and Building Owners and Managers Association (BOMA) were granted standing and were represented by Counsel during most parts of the evidence and during the final submissions.

The tallest highrise buildings in Ontario are office buildings. When the height of some of these buildings is combined with their potential for a large occupant load during working hours, the importance of effective evacuation procedures which are understood by all persons who work within the building is obvious.

Office buildings, unlike apartment buildings and the residential areas of hotels, usually have open concept floor plans. This fact is significant for two reasons. First, any containment of fire and smoke provided by compartmentation is dramatically less in office buildings, and therefore open concept plans require a consideration of the need for sprinklers. Second, in open concept plans, if evacuation of the fire floor is impossible, defending in place may be difficult if not impossible. In an apartment building or hotel, compartmentation makes remaining in one's suite an option *if* evacuation is impossible.

However, open concept plans do allow for earlier detection of fire than in a compartmented building. Most areas of highrise office buildings are occupied during normal working hours. This also results in early detection of fires. At other times of the day most office buildings have security staff within the building.

Highrise commercial buildings often contain mixed uses. Most commonly, in highrise office buildings one finds mercantile and assembly occupancies on lower and below-ground levels with office areas above.

Recently, I have noted that floors containing residential suites are now appearing in highrise buildings where other floors contain mercantile and office space.

Mixed uses and the presence of shoppers, clients and other persons unfamiliar with the building complex, make fire safety planning more complicated than in buildings where there is only one type of use. For instance, in the case of a residential/office complex, emergency evacuation procedures will have to integrate evacuation of residential tenants and those who work on the commercial floors, groups which will have different levels of fire safety training.

In Chapter 3, I referred to the lack of control of occupants of apartment buildings by management. In office buildings, the relationship between occupants and management is more structured. Control of the workers' environment by building management and employers is commonplace. These factors allow management and employers to require tenant participation in fire drills and fire safety programs to a much greater degree than in apartments or hotels. The degree to which this opportunity is exploited by building management and employers to improve life safety within their buildings, varies from building to building.[1]

THE FIRES

During the Inquiry, only one fire in a highrise office building was reviewed. That fire occurred in the Royal Trust Tower of the Toronto Dominion Centre, Toronto, on November 10, 1973.

During the report-writing stage of this Inquiry, a fire occurred at the First Canadian Place, Toronto, Ontario. This is a 72 storey office building which has mercantile establishments at grade level and on sub-grade levels. As part of its normal duties, the OFM investigated this fire and prepared a written report. That report has been provided to the Inquiry and has been filed as an exhibit.[2]

Toronto-Dominion Centre, Royal Trust Tower

On November 10, 1973, a Saturday night, there was a fire on the 28th floor of the Royal Trust Tower of the Toronto-Dominion Centre in Toronto, Ontario. Peter Gathercole prepared the report about this fire for the Office of the Fire Marshal, and gave evidence at this Inquiry. The information which follows describes the building as it was at the time of the fire.[3]

Description of the Building:

The Royal Trust Tower is one of three towers making up the Toronto-Dominion Centre on the south-west corner of King and Bay Streets in Toronto. These buildings were built before the passing of the BCA in 1975. Construction standards were governed by the City of Toronto Municipal Building By-Law.

The Royal Trust Tower is 44 storeys in height with a basement shopping complex. It was constructed of protected steel, and had poured concrete floors. The steel beams were protected from the effects of fire by the use of a fire proofing application.

All essential services were concentrated in a central core area of the building. This core area contained the passenger elevator lobby, four sets of stairs, a freight elevator which was located in an enclosed lobby, washrooms, electrical room and air conditioning ducts. Conditioned air was supplied from the central core to four floor zones through sheet steel ducts. Air was returned through slots in the fluorescent lighting fixtures, and was then drawn into collecting ducts located above the acoustical ceiling.

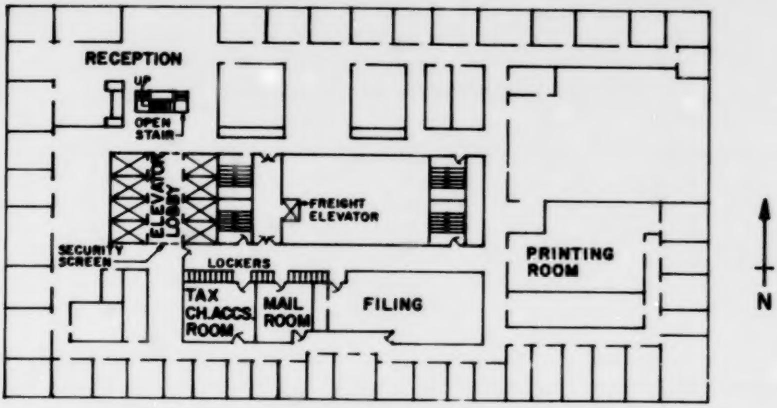
The outer walls of the building were made up of glass panels set in a curtain-wall. The poured concrete floor slabs extended right up to the inner surface of the curtain-wall.

There were mechanical rooms located on the 19th, 33rd and 44th floors.

The central core of the 27th floor was surrounded by offices on the outer walls. To the south, between the central core and the exterior offices, were the filing room, mailroom and tax chartered accountant's room. From the reception area, which was located to the north of the passenger elevator lobby, an open stair led to the 28th floor. A smoke detector was installed on the 28th floor, at the top of the open stairway.

Chronology:

The fire started on a Saturday evening. All persons who were known to have been on the floor of fire origin were reported to have left the building by 2 p.m.



FLOOR PLAN, 27th FLOOR
ROYAL TRUST TOWER
TORONTO DOMINION CENTRE

The fire started simultaneously in the chartered accountant's room and in the hallway which separated that room from the exterior row of offices. Investigators determined that the fire was an incendiary or arson fire, and was started by using a flammable liquid which was poured in the corridor and in the accountant's office.

Smoke began to move down the corridor and through the core area. It then moved up the open stairway and caused the smoke detector at the head of that stairway to activate. Upon hearing the fire alarm, a security guard checked the annunciator panel and assumed that the fire was on the 28th floor.

Smoke Movement and Fire Damage:

Members of the fire service reported to the investigators that the smoke was extremely heavy on the 27th and 28th floors. There was some movement of smoke through the air recirculation system. However, there does not appear to have been a great deal of smoke movement above the 28th floor because the air recirculation system was shut down for the weekend.

This fire was extemely intense. The heat from the fire caused soldered joints in the domestic water lines to separate. For this reason, water began to leak out of the domestic water lines and may have interfered with the operation of the elevator. The fire destroyed the acoustical ceiling and attacked the structural steel beams directly over the mailroom and the accountant's office. The protective coating providing a fire resistance rating that had been applied to those beams was destroyed and one of the beams was distorted due to the heat. This beam was 27 inches deep, and the heat of the fire caused it to bend approximately 1 ½ inches.

Fire Alarm System:

> "The building contains a full fire alarm system, electrically operated and supervised with manual stations provided at all stairs and elevators. Alarm sounding devices are provided on all floors and annunciation for the entire system is provided behind the reception desk on the main floor. Rate of rise heat

> detectors are provided in electrical rooms only. Other than that, the only products of combustion detection employed above the basement level consists of ionization chamber type smoke detectors located in the return air ducts at the machine room levels."[4]

In this case, of course, there was also a products of combustion detector or smoke detector at the head of the open stair that led from the 27th to the 28th floors. The other products of combustion detectors were located in the air ducts. However, because this fire took place on the weekend, the air conditioning system was shut down. While this had the positive effect of not drawing significant amounts of smoke into the recirculation system, it also means that not enough smoke moved into the system to cause the smoke detectors to activate.

As mentioned above, the smoke detector at the head of the open stairwell eventually activated and was annunciated at the panel on the main floor. The security sergeant and another guard, assuming that the fire was on the 28th floor, took the service elevator to the 27th floor. They believed this to be the floor below the fire floor. They entered the service elevator lobby where they encountered heat and smoke. The security sergeant then sent the other guard back to the main floor to call the fire department, while he remained on what he still believed to be the floor below the fire floor. He was overcome by smoke and subsequently rescued by the fire department.

The fire alarm system in this building was not directly connected to the fire department. The action of the guards in checking the fire before calling the fire department resulted in some delay in calling the fire department.

Suppression:

The fire call was received at 9:56 p.m. The first crew that arrived attempted to reach the floor below the fire floor by using the elevator. They pushed the button for the 26th floor, but for some reason the elevator went to the 27th floor, the fire floor, and the doors opened. The firefighters closed the doors and again attempted to reach the 26th floor. However, the elevator then took them to the 28th floor. They again tried to reach the 26th floor, and again the elevator stopped at the 27th floor, the fire floor, and the doors opened. By this time, the fire was very severe, and the firefighters had to lie on the floor of the elevator car while forcing the doors to close. The car then went to the 26th floor and the firefighters attempted to reach the fire by going up the stairwell.

They first attempted to use the southwest stairwell. When they reached the 27th floor, they found that the metal door was cherry red from heat. Further, the door itself was locked and could not be opened from the inside. They eventually went back down to the 26th floor and approached the fire from the northeast stairwell. They then attacked the fire from the east end of the central core.

One of the major difficulties encountered by the fire department was that there was no way in this building to vent smoke or heat during and after suppression. The OBC now requires new highrise buildings to have some method for venting smoke and heat in these circumstances.[5] This, of course, is different from smoke control. The purpose of venting is to remove smoke and heat from the building, not to control its movement inside the building.

Because some water from firefighting activities got into the bus duct system, there were some power outages experienced after the fire on lower floors.

Significant Findings and Conclusions arising from this Fire:

1. The products of combustion detectors located in the air plenums did not activate because the air system was shut down.
2. The problem of false annunciation resulted in a serious threat to the safety of the guards and firefighters.
3. There was no key-operated firefighter's elevator to allow firefighters to bypass the fire floor.
4. The door from the stairwell to the fire floor was locked.
5. There was no way of venting heat and smoke from the fire floor without breaking windows. This presents a danger to persons and property at street level.
6. The leakage of water into the busway system resulted in power outages.
7. The fire took place at a time when the building was almost totally unoccupied.

First Canadian Place

On June 10, 1983, there was a fire at the First Canadian Place in Toronto, Ontario. The submissions of Counsel at this Inquiry were completed on June 6. This fire took place shortly thereafter, and the information given below is taken from a report prepared by the Office of the Fire Marshal.[6]

Description of the Building:

> "First Canadian Place is a 72 storey office building of non-combustible and fire resistive construction, located on the northwest corner of King and Bay Streets in the City of Toronto.
>
> The building has a standpipe hose system throughout and is fully sprinklered. The sprinkler system is connected to the building fire alarm system, which also includes heat detectors in unsprinklered electrical rooms, smoke detectors within air ducts and manual pull stations throughout. Fire alarm annunciator panels are located in a sub-concourse level security section (Building Control Centre). Fire trouble and alarm conditions are monitored here 24 hours per day 7 days per week by in-house employees. Fire equipment tests involving different groups of 5 floors are conducted weekly. Other non-fire features are also monitored from this area. Detailed explanations of the equipment and operation of the Building Control Centre were not sought during this visit.
>
> The building contains four fire separated stairwells. For security reasons it is only possible to re-enter into floor areas at every fifth floor. Crossover signs are appropriately placed on those floors, and the floors and doors are all colour and number coded. When tenants move into the complex, they receive a listing of the crossover floors.
>
> Diesel fueled generators provide emergency power for numerous building facilities, such as the emergency light system, the elevators and other essential services. In addition, the electric booster pumps associated with the sprinkler and standpipe systems are supplied independently from the main power supply.

Smoke Control Features

In order to control the movement and development of smoke when a fire occurs, smoke control features have been incorporated into this building design.

Computer controlled air fans and dampers provide pressurization of stairwells, elevator shafts and floor areas to contain smoke migration by restricting the free movement of air.

The building is fully sprinklered. This feature is intended to control and/or extinguish the fire, thereby limiting smoke development."

The building smoke control system is closest to measure "A" as defined in the supplement to the National Building Code, with supplementary measures to pressurize the stairwells and elevator shafts.

Chronology:

"At approximately noon on June 10, 1983, an office receptionist observed smoke coming out from beneath the service elevator lobby doors on the 34th floor at First Canadian Place. She then heard the sound of a shower, which was in fact the actuation of a sprinkler head, coming from the service elevator lobby. As she proceeded to the inner office to inform the other people of the smoke, an alarm sounded on the 33rd, 34th and 35th floors. At this point, the receptionist called the Toronto Fire Department and notified the building security, as established in the emergency action program.

This alarm condition also appeared on the annunciator panel at the Building Control Centre. . .At this point security notified the fire department."

Smoke Movement and Smoke Control System:

"Dense black smoke was reported to have developed during the fire. Some of this smoke was drawn into the service elevator shafts. When the lobby doors were opened by the firefighters, smoke spread on the 34th floor, apparently into the nearby passenger elevator area, and into the elevator shafts. The spread of smoke through these shafts could account for the smoke that was smelled on other floors. . .

Smoke was said to be primarily limited to the 34th floor, and was most dense between the service elevators and the return air ducts in the north-east corner of the building. No smoke was reported to be visible in the stairwells.

Tenants 10 and 20 floors away from the fire floor could smell smoke during the incident with the result that numerous secondary alarms were recorded at the Building Control Centre when these tenants used pull stations. Building personnel also indicated that smoke billowed out of the main elevators on the ground floor.

When the sprinkler head in the service elevator lobby activated, an alarm was registered at the fire alarm control panel

> in the Building Control Centre. The receptionist who discovered the fire also called the control centre and confirmed the location of the fire.
>
> At this point, the computer controlled mechanical systems were put into the 'fire mode' sequence by the use of a keyed switch. When the fire mode sequence is engaged, all the building fans immediately shut down. Next, the fresh air dampers for the stairwells and elevator shafts all opened and the fresh air dampers leading to the floor areas all closed. The computer then restarted the fresh air circulating fans, thus pressurizing the stairwells and elevator shafts and minimizing the movement of smoke-filled air into these vertical shafts."
>
> [The computer then put the system into the smoke control mode]. . .All the return air dampers leading into the return air shaft were closed. This was the last sequence that was computer operated. At this point, the return air damper on the 34th floor was manually opened and the return air fans were restarted. This resulted in the smoke being drawn into the return air shaft (which in effect became a smoke shaft) from the fire floor and exhausted to the exterior.

Egress and Emergency Action Organization:

The emergency action organization in the First Canadian Place was described by Mr. Jack Gringorten when he was a witness at the Inquiry.[7] The Fire Marshal's report continues:

> "[After the alarm condition,] security announced over the public address (P.A.) system that they would investigate, and then announce evacuation if necessary. They were also engaged in the review of secondary alarms that resulted from people pulling manual pull stations on floors removed from the fire floor, due to the smell of smoke.
>
> The fire itself was controlled by one sprinkler head. That floor (34th) and the floor above and below were immediately evacuated, which is normal procedure.
>
> In addition to evacuating the fire floor and the floors immediately above and below, any decisions to evacuate other floors are then made by the fire department, or in the case where the fire department has not yet arrived and it is felt warranted, the decision to evacuate other floors can be made by the building manager. This chain of command is described in the building emergency guidelines.
>
> Apparently in this instance, a member of the building staff ordered the evacuation of other floors, without consulting the building manager. This evacuation was carried out in stages, with five floors above and below the fire floor evacuated in turn. This sequence continued until floors 20 through 71 were evacuated. The decision for this evacuation was presumably due to the fact that many tenants on non-fire floors could smell smoke and consequently activated manual pull stations.
>
> From the time the first alarm sounded, it took approximately 1 hour 20 minutes for the occupants of 51 floors (approximately 10,000 people) to evacuate the building to the south side of

> King Street (with some police assistance). There were only five minor injuries reported, all due to heat exhaustion during the evacuation process from the upper floors.

Review of Evacuation

> Preliminary tenant comments were, for the most part, positive. For some, the increased awareness for the potential for an inferno prompted a great deal of 'what should I do if' questions. Several were concerned that alarms were not audible.
>
> Many tenants felt that communications could have been better. In spite of the fact that people were evacuated smoothly and in stages relative to the identified hazards, they still expected to have continual verbal reassurance and updates.
>
> Co-ordination of communications between fire department and building personnel could permit a better flow of information. Certainly a workable communication network should be part of an accepted Fire Safety Plan, as required by the Fire Code.
>
> Nevertheless, the evacuation of people from 51 floors of the building was conducted smoothly and with few injuries, indicating the merit of pre-fire emergency planning."

Significant Findings and Conclusions arising from this Fire:

1. This was the first fire in a highrise building which was equipped with smoke control measures which included pressurization methods. It appears that the equipment operated as designed.

STATISTICS

Based on OFM statistics, there have been no fire deaths in highrise office buildings in Ontario during the period 1976 to 1981.[8]

The injury rate for office and mercantile buildings (all heights) in Ontario for the period 1976 to 1981 expressed as the number of injuries per 1,000 fires is 82.2 and 85.3, respectively. The injury rate for residential buildings is only slightly higher at 91.4.[9]

In New York City during the period 1966 to 1971, six deaths occurred in "highrise" office buildings. The New York City statistics include "the fire record of 2,000 office buildings of which 800 were more than 100 feet in height. Furthermore, these buildings had been built before the Codes incorporated additional requirements in highrise buildings. None [of these deaths] occurred in a fully occupied building during office hours."[10] The above statistics relating to New York City come from an article by Mr. Charles E. Schaffner, Executive Director of the Mayor's Advisory Committee on Fire Safety in Highrise Office Buildings.[11] That Committee was formed by the Mayor of New York City in 1971, at least in part, as a response to two fires in highrise office buildings in 1970.

Although it is correct to say that the fire record in highrise office buildings is exceptionally good, I believe the subject was put into proper perspective by Mr. Schaffner when commenting on the New York statistics. He stated:

> "Many are tempted to say that the record shows little to justify changes in Code requirements. Unfortunately, however, we are dealing with a far greater potential for tragedy. In a sense we have been fortunate. . ."[12]

[1] This matter is the subject of more detailed comment in Chapter 15.

[2] Exhibit 314.

[3] Exhibit 108; Evidence of Peter Gathercole, Transcript, Volume 19, pp. 46 to 73.

[4] Exhibit 108, p. 2.

[5] OBC Article 3.2.6.5.

[6] Exhibit 314.

[7] Transcript, Volume 52, pp. 115 to 130.

[8] Exhibit 9.

[9] Exhibit 235, table 1, p. 5.

[10] Exhibit 235, p. 15.

[11] Exhibit 235, Appendix C.

[12] Exhibit 235, Appendix C; A further discussion of the fire record in highrise office buildings is found in Chapter 1.

Chapter 6

Institutions

INTRODUCTION

Other than a brief reference to correctional facilities, hospitals were the only institutional buildings which were the subject of evidence before the Inquiry.

Hospitals, like other occupancies, have characteristics peculiar to them which affect how fire safety is best achieved. Patients in hospitals are often physically unable to leave their rooms on their own. This fact has a significant effect on fire safety planning within a hospital, particularly regarding evacuation.

The difficulty posed by *total* evacuation of a hospital is met by creating protected areas within the hospital itself. This is done by installing smoke barrier doors in corridors which, once closed, compartmentalize the floor into one or more separate areas. It is common for the smoke barrier doors to be equipped with hold open devices which hold the door open during normal conditions but cause the door to close automatically when the fire alarm is activated. Pending movement of patients to safe areas, the hospital rooms, which are compartments with fire resistance ratings similar to apartments and hotel guest rooms, provide protection from fire.

Because of the helpless position in which many patients or inmates would find themselves if a fire occurred, those in charge of health care facilities and correctional institutions have a very onerous responsibility to ensure life safety within their buildings.

Other unique features of hospitals which have an impact on fire safety planning are the existence of special hazards such as the laboratories, kitchens, general service areas and the central storage of supplies.

The OFM has assisted hospitals with fire safety planning for many years. Hospitals have received priority treatment by the fire service in terms of pre-fire planning and the size of fire department response to a fire alarm. This attention has been the result of recognizing the unique features of hospitals.

The Retrofit Task Group on Part 9 of the OFC has recognized the importance of fire safety in hospitals by assigning high priority to retrofit requirements for health care facilities. Draft retrofit regulations have been prepared.[1]

THE FIRES

Two hospital fires were the subject of evidence during the Inquiry. One occurred at St. Joseph's Hospital in Hamilton on May 1, 1980. Total evacuation of the hospital occurred because of smoke migration. The other fire occurred at Sunnybrook Hospital in Toronto on March 27, 1983. The fire was suppressed after a quick response by the North York Fire Department. This fire was examined in order to assess the effectiveness of smoke barrier doors.

St. Joseph's Hospital, Hamilton

Peter Gathercole, of the Office of the Fire Marshal, investigated the fire which took place on May 1, 1980, at St. Joseph's Hospital, 50 Charleton Avenue in Hamilton, and prepared a written report. Mr. Gathercole filed that report with the Inquiry and gave evidence about the fire.[2]

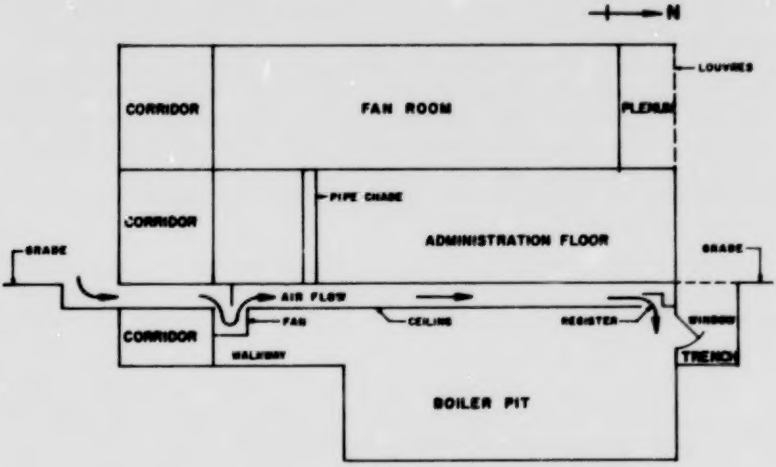
Description of the Building:

This Hospital consists of two buildings, one known as the Annex, and the other as the Patient Care Tower.

The Annex is a two storey building with a basement boiler room which has two separate levels below grade. The boilers themselves are contained in a large pit in the boiler room, which is approximately 10 to 12 feet deep.

The Patient Care Tower is an eight storey building. The two buildings share a common wall.

Both buildings were constructed of reinforced concrete, with poured concrete floors and brick exterior walls.



ST. JOSEPH'S HOSPITAL
HAMILTON
NORTH-SOUTH SECTION THROUGH ANNEX

FIGURE 1

Figure 1 shows a north-south section through the Annex. There was a false ceiling installed over the entire basement area, and a fan installed near the south end of the ceiling. This fan was designed to blow air through the false ceiling space over the boiler room. Before the installation of this ceiling and fan, the heat generated by the boilers raised the temperature in the walkway area, and immediately below the administration floor, to between 160°F and 200°F under summer conditions. This resulted in serious discomfort for people working on the administration floor.

When this false ceiling was installed, insulation was provided on the top surface of the false ceiling and on the bottom surface of the administration floor.

The material used was 2 inch glass wool batts which were glued to a paper vapour barrier. Two layers of this material were put directly on top of the ceiling, while two more layers were attached to the underside of the concrete slab above.

The top floor of the Annex was a large fan room. The north wall of the fan room was a large air intake plenum, with louvres on the outside of the wall which were used to adjust the flow of air into the plenum.

There was a pipe chase which passed from the false ceiling space in the boiler room and opened directly into the fan room at the second floor level. This pipe chase was not fire stopped in any way.

This Hospital had a pneumatic tube message transfer system. This consisted of tubes arranged in loops at various points in the building. One of the tubes ran through the false ceiling space in the Annex, went through the floor slab into the administration floor, and then into the fan room. These tubes were contained in hollow plaster structures that passed through the floor slabs without being fire stopped.

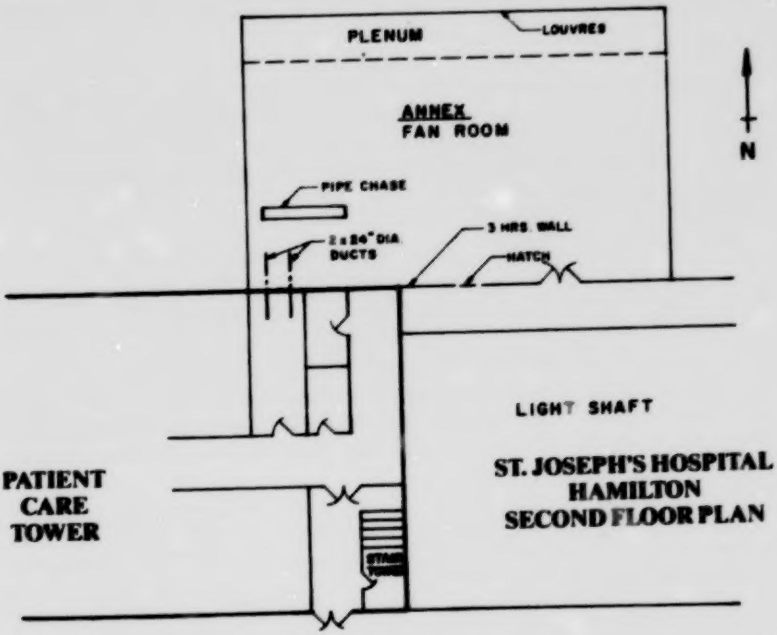


FIGURE 2

Figure 2 shows the portion of the Annex and Patient Care Tower that shared a common wall. There were double doors leading from the fan room into a corridor in the north wall of the Patient Care Tower. That corridor led to offices and a stairwell.

There were two 24 inch diameter air supply ducts which ran from the fan room to the Patient Care Tower, penetrating the south wall of the fan room. These ducts were not equipped with fire dampers, and the space between the two ducts was not fire stopped. These ducts supplied air to air conditioning cabinets which were mounted under each window in the Patient Care Tower.

Chronology:

On the morning of May 1, 1980, two maintenance workers were standing on the walkway beside the boiler pit. They noticed that a hanging fluorescent light fixture which was suspended over the boiler pit was flickering. They saw sparks around the fixture and then all of the lights went out in the boiler room.

At the same time, the fire alarm system sounded and the annunciator panel was found to be indicating fire in the boiler room and also on the 7th floor of the Patient Care Tower.

The fire was actually located in the false ceiling space above the boiler pit. There was no fire on the 7th floor, and it is not known why the annunciator panel indicated fire in that location.

The fire department arrived shortly thereafter and attempted to put out the fire in the false ceiling space. For a number of reasons, the fire service had great difficulty in extinguishing this fire. By 10 a.m., it was clear that smoke conditions in the Patient Care Tower were becoming intolerable, and a total evacuation of the building began.

Smoke Movement:

The fire was burning in the false ceiling space above the boiler pit. The fuel for the fire was primarily the paper vapour barrier glued to the glass wool insulation. Mr. Gathercole added that there may have been a substantial build up of dust and other combustibles due to the absence of an air filter on the exterior of the building. The products of combustion being produced entered the pipe chase and moved up the pipe chase into the fan room above.

> "In effect, the ceiling space was simply acting as a gas producer, as it were, or as a cooker, and the fire was burning at the point where the gas left the pipe chase at the fan room level. This was where the major burning was taking place. . . .The pipe chase in question was acting as a huge gas jet."[3]

In their efforts to fight the fire, the fire department found it necessary to open the double doors between the fan room and the Patient Care Tower. They also opened the door to the stairwell. This allowed smoke to move into the stairwell.

Smoke also moved through and around the two 24" diameter air conditioning ducts because these ducts did not have fire dampers inside them, and the space between and around them had not been fire stopped. The movement of smoke into these ducts allowed the smoke to rise into the air conditioning cabinets mounted under the windows in the Patient Care portion of the building.

Another avenue of smoke migration was the pneumatic tube message transfer system. The smoke followed the route of the tube, and the area around the tube was not fire stopped where it penetrated ceilings.

Smoke entered the Patient Care Tower at the east end of the building, and travelled slowly through the entire building towards the west end. All floors were contaminated with smoke.

Fire Alarm System:

There were products of combustion detectors in the boiler room area. However, they were installed on the underside of the false ceiling. Because the fire started above those detectors, they did not activate. However, the fire alarm did activate. Mr. Gathercole was of the opinion that the fire alarm sounded as a result of the fire attack on the wiring of the fire alarm system.

The hospital was connected to an independent central station. Upon activation of the alarm, the service notified the Hamilton Fire Department. A second call was received by the fire department less than thirty seconds later from the hospital switchboard operator. She informed the fire department that the alarm was registered on the seventh floor and in the northeast corner of the basement.

The annunciator indicated that fire alarms were received from both the basement and the 7th floor in the Patient Care Tower. Investigators were unable to determine why the annunciator indicated a call on the 7th floor. However, this false annunciation did cause some confusion for both the police and the fire department personnel when they first arrived.

Fire Suppression:

After their arrival at the fire scene, members of the fire department attempted to open up the false ceiling over the boiler room using equipment called "pipe pulls". However, due to the combination of the type of construction of the ceiling and the extreme height of the ceiling (25 to 30 feet), it was impossible to pull it down.

Ultimately, the fire service extinguished the fire by going into the second floor fan room and injecting foam into the pipe chase which ran between the fan room and the false ceiling space.

Egress (Patient and Staff Action):

The initial alarm was received by the Hamilton Fire Department at approximately 9:16 a.m. When it became clear that it would take some time to bring the fire under control, and that smoke migration throughout the Patient Care Tower would endanger the patients, the decision was made to begin evacuation of the hospital. Police and fire personnel assisted the hospital staff with the evacuation. Shortly after 10 a.m., the Pediatrics Ward was evacuated. By 10:13 a.m., the Fire Chief had decided to remove all of the patients from the building, as smoke conditions were getting very heavy on the upper floors. By 10:46 a.m., all patients had been removed from the 4th, 5th, 6th and 7th floors. The evacuation of the Surgical Building was completed by 10:48 a.m.

A study of the evacuation was done for the National Research Council.[4]

> "The fact that no one was injured meant that all those interviewed had a fairly positive view about what had happened. They were ready and willing to share their own experience with others. The fact things went according to plan meant that it was possible to examine what happened when a plan was actually implemented. And the fact the St. Joseph's Plan is so similar to other plans meant that what we found would seem to have general application.
>
> It would not be correct to suggest that everything that happened at St. Joseph's went precisely according to plan. It has been established, for example, that a number of personnel did not react to the original fire announcement. . . .It has also been established that many part-time staff, volunteers, students, physicians and others did not have much, if any, training. A few other rules were also broken. But,. . .most of what went on, especially in patient areas, was under the direction of the full-time nursing staff and that staff was basically familiar with the plan and carried it out. . .

> [This] means the response to the fire took place in stages. The first alarm — announced over the public address system — resulted in staff on each ward being briefed about what to do. That was followed by actual activity — fire doors and room doors were shut. Then, as smoke conditions became prevalent, patients were moved from the rooms to central areas on each ward, sometimes, but not always, near stairwells. Finally, as the general evacuation order was given, all persons, including patients, made their way down the stairwells and out of the Hospital.
>
> In a few places, there was some variations from this general pattern. In some places where a patient's health might be genuinely endangered — the Operating Rooms, Intensive Care — there was deliberately no real initial response. In one ward, where smoke conditions built up rapidly, evacuation down the stairs preceeded the formal, general evacuation order. In several instances, the telephone was used despite rules to the contrary and for some time, the elevators were used in belief that it was not a real fire.
>
> Later, in a few cases — after consultation with fire personnel — the elevators rather than the stairs were used for evacuating immobile patients. But in most parts of the Hospital, the procedures followed the plan and the plan called for a staged response. Things went very much according to emergency routine.
>
> [This] suggests that to a considerable extent, staff will respond to an emergency situation in line with established procedures and training. It also suggests they are less likely to act without some form of orders. The fact that a number of wards waited for a formal evacuation order despite continually worsening conditions suggests a high degree of reliance on a formal command structure. This conclusion is supported by the fact that those who had less than adequate training — the part-time staff, the volunteers, the students — felt somewhat ill at ease, a need for direction. (This unfortunately was not always true of physicians: they were inclined to act and give directions whether they had been involved in training or not.)"[5]

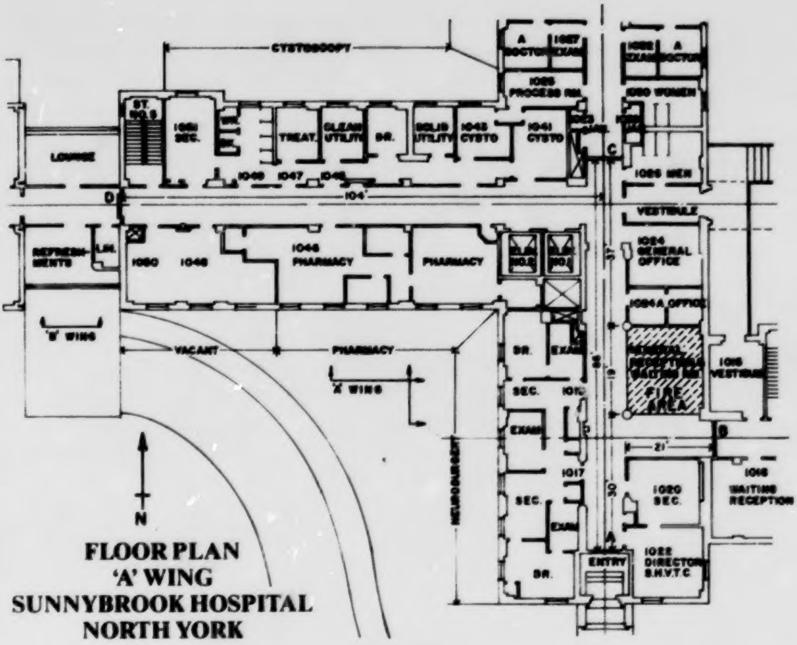
Sunnybrook Hospital

On March 27, 1983, at 1 a.m., there was a fire on the main floor of Sunnybrook Hospital in North York. Fire Chief Joseph Gibson gave evidence about this fire. He advised the Inquiry that he believed this fire to be of special interest because it demonstrated the value of smoke barrier doors. For that reason, his evidence dealt mainly with the function of those doors.[6]

Description of "A" Wing:

Sunnybrook Hospital, being an institutional building, is classified as a Group B building by the Ontario Building Code. "A" Wing is four storeys high and has patients on the 4th floor. For that reason, it is classified as a highrise building for the purposes of the OBC and the Ontario Fire Code.

This Wing was built in the 1940's. During subsequent renovations two false ceilings were installed over the general reception and waiting room area. Before the fire, the waiting room was furnished with approximately 35 chairs and a reception desk.


CYSTOSCOPY
LOUNGE
ST. NO.5
1051 SEC.
TREAT.
CLEAN UTILITY
DR.
SOILED UTILITY
1043 CYSTO
1041 CYSTO
A 1027 DOCTOR EXAM
1026 PROCESS RM.
1032 A EXAM DOCTOR
1030 WOMEN
1028 MEN
C
1049
1047
1045
104'
D
VESTIBULE
REFRESHMENTS
L.M.
1050
1048
1046 PHARMACY
PHARMACY
ELEV. NO.2
ELEV. NO.1
1024 GENERAL OFFICE
1024A OFFICE
37'
'B' WING
VACANT
PHARMACY
'A' WING
DR.
EXAM
SEC.
1019
GENERAL RECEPTION & WAITING RM
FIRE AREA
1016 VESTIBULE
B
21'
EXAM
1017
SEC.
30'
1020 SEC.
1018 WAITING RECEPTION
EXAM
NEUROSURGERY
A
ENTRY
DR.
1022 DIRECTOR S.H.V.T.C
N

FLOOR PLAN
'A' WING
SUNNYBROOK HOSPITAL
NORTH YORK

FIGURE 3

Of special interest in this fire are the smoke barrier doors. These doors were located inside the main entry area (A), immediately to the north of the general reception and waiting room area (B), immediately to the south of the elevators (C), and in the corridor between "A" Wing and "B" Wing (D).

Chronology:

Investigation by the OFM determined that this fire was an incendiary or arson fire. It began in the waiting room area and destroyed all of the furnishings in the area. Upon activation of the fire alarm, a security guard attempted to approach the fire from "B" Wing through Door D. He was driven back by heat and smoke.

Smoke Migration:

There was some smoke migration through the air distribution system.

Chief Gibson demonstrated the effect of the smoke barrier doors by showing photographs of the corridors after the fire. He was not certain how Door A came to be closed, but it is possible that it was always in the closed position. Doors B and C, while they were equipped with automatic hold open devices, had been closed manually during a regular tour of inspection by a security guard. Door D, which also had a magnetic hold open device, closed automatically on the sounding of the fire alarm.

In all cases, the contrast between the soot encrusted walls on the fire side of the doors, and the cleanliness of the area on the other side of the doors was quite impressive. Clearly, the smoke barrier doors operated as intended, inhibiting the movement of smoke, and containing it in the zone created by the installation of these doors.

Chief Gibson also demonstrated that the normal fire-rated doors on the entrances to the doctors' offices kept those offices quite clean in comparison to the corridor.

Fire Alarm System:

There was no smoke detector in the waiting room. It appears that the fire alarm was initiated by a smoke detector in one of the office areas nearby.

The fire alarm system was directly connected to the North York Fire Department. I understand that this is not an unusual practice in hospitals.

Egress:

Although most of the smoke was contained on the main floor, some smoke did move through the air handling system to the top floor. For this reason, it was necessary to evacuate 32 patients who were housed on the top floor.

As I mentioned above, this fire was reviewed for the purpose of examining the operation of smoke barrier doors. For that reason, the Inquiry did not study other aspects of this fire and its suppression.

[1] Exhibit 289.

[2] Exhibit 111; Transcript, Volume 20, pp. 4 to 35.

[3] Transcript, Volume 20, p. 16.

[4] Aldred, Hiscott and Scanlon, *Mayday at St. Joseph's: Fire and Evacuation at a Major City Hospital* (1982).

[5] *Ibid*. pp. 45 to 46.

[6] Exhibit 282; Evidence of Joseph Gibson, Transcript, Volume 60, pp. 90 to 101.

Chapter 7

Building Systems: Smoke Control

INTRODUCTION:

Construction standards for highrise buildings must not only provide for the structural integrity of the building, but also ensure life safety in the event of fire.

The Ontario Building Code is the product of a great deal of building research and the emphasis has been on the engineered aspects of building construction. I was interested to learn that, even in this highly technical discipline, there are a great many judgements to be made and assumptions about the acceptability of risks. For example, when designing a building to withstand weather conditions, assumptions must be made about the probable weather conditions in any particular area and the possibility of an unusual climatic event such as a "100 year storm".

A great many of the requirements found in existing building codes are directed to ensuring life safety in the event of fire. In this Chapter and the next I will discuss some of the building systems found in current building codes which address life safety in the event of a fire. These systems provide for the containment, detection and suppression of fire. They also provide for a means of egress during fire emergencies.

Containment of *fire* is dealt with mainly by compartmentation. However, in highrise buildings, containment must also be directed to the control of smoke and other products of combustion inside the building.

In this Chapter I discuss building systems and design which, through containment, suppression or mechanical means, control the movement of smoke.

Those building systems which deal with detection as addressed in building codes are discussed primarily in Chapter 8.

The suppression aspects of building codes are directed primarily at systems installed within the building for purposes either of assisting the fire service in suppression or of undertaking automatic suppression. Insofar as it relates to the activity of the fire service, suppression is dealt with in Chapter 12.

Finally, means of egress must be provided at the appropriate locations, with a view to the number of persons that must be served in an emergency situation, and must be designed in such a way as to provide protection from fire and smoke. Direction must be given to building occupants as to the proper ways to use the means of egress. This latter matter is discussed in Chapter 15.

NATIONAL RESEARCH COUNCIL:

The National Research Council of Canada is a Crown Corporation which was established in 1916. NRC has two main objectives, one being to promote research and the other, to distribute scientific and technical information. Research is done both in-house, and through the Industrial Research Assistance Program.[1]

Dr. Lorne Gold, a witness at the Inquiry, is the Director of the Division of Building Research. This Division was established in 1947, and is divided into a number of Sections, each Section studying a specific aspect of buildings.[2] While the Fire Research Section is most directly related to the interests of this Inquiry, results of research done by the Energy Research Section and the Building Use Section have been incorporated into building codes.

The Fire Research Section itself was formed in 1950, and studies such matters as building components, flammability, toxicity, compartmentation, and the fire safety aspects of building design.

> "The movement of smoke during fires is another major area of interest in the Section. In programs jointly conducted with other Sections of the Division of Building Research, various strategies have been developed to control smoke movement during fires in highrise buildings. Special attention has been paid to the problem produced by our cold winters. The influence on smoke movement of stairwells, elevator shafts and specially provided smoke shafts is a major project at the Almonte Field Station.
>
> The full size, ten storey tower is equipped with devices to detect gases, smoke and temperature changes at several positions on each floor."[3]

The Fire Research Field Station at Almonte, a structure which was recently completed, consists of a burn hall and a ten storey experimental fire tower.

> "The tower building is specifically designed for research on methods of controlling the movement of smoke during fires in highrise buildings in cold climates. It comprises an experimental tower and a protected service tower, both ten storeys high. The experimental tower design provides a central core containing typical shafts (elevator, stair, service, etc.), with a minimal floor area of about 400 square feet on each floor where controlled experimental fires can be burned. It is also possible to do experiments on fire in service shafts. The exterior cladding of the experimental fire area is removable, permitting installation of typical building facades for a study of exterior fire spread."[4]

Experiments in the tower building will also be designed to test the performance of some of the Smoke Control Measures which have been identified in the Supplement to the NBC since 1973.

Canada is in the forefront in the study of smoke movement,[5] and one of the goals of work being done at Almonte is to develop a designers manual which would give more specific data for designing smoke control systems.

SMOKE MOVEMENT:

In the early 1960's, the Energy Research Section of the Division of Building Research was involved in a project which included the measuring of pressure differentials in tall buildings in order to investigate pressures caused by stack action during cold weather.

The purpose of the study was to assist in the designing of heating and cooling systems in high buildings by developing a mathematical model building which would simulate air flow in high buildings. The normal air flow in a highrise building, particularly in cold climates, is described as stack action. Mr. Tamura appeared at the Inquiry and described the reasons for stack action in these buildings and the factors that can influence this phenomenon. The understanding of normal air movement is necessary in order to plan heating and cooling systems and air recirculation in highrise buildings. The mathematical model would allow probable air flows in a particular building to be predicted by using a computer. This work was undertaken primarily by John McGuire and George Tamura.

At the same time, Murdoch Galbreath, also of NRC, was examining the amount of time required for evacuation in high buildings. For this reason, he wanted to know how quickly smoke would migrate in these buildings, and took his problem to Tamura and McGuire. They used the mathematical model which was developed by the Energy Research Section.

The major assumption made by the researchers from NRC in the study of smoke movement is that the movement of smoke in highrise buildings will duplicate the normal air movement experienced on a daily basis.

Normally, air movement inside a highrise building is affected by the difference between the internal and external temperature. If the temperature outside the building is significantly lower than the internal temperature, at the lower levels of a building air will tend to move into the building from the outside, because the outside air is denser than the air inside. However, at the top of a high building, the situation is reversed. The exterior air becomes less dense, and air will tend to move from the inside of the building to the outside. Therefore, at the bottom of a high building air is moving *into* the building, while at the top of the building, air tends to move *out*. The whole building acts like a chimney. This phenomenon is described as *natural* stack action.

At some point between grade and the top of the building, there will be a point or level in the building where the exterior air pressure is equal to the interior air pressure, with the result that there is no air movement either into or out of the building. This level is called the neutral plane. The neutral plane in any specific building moves up and down as a result of changes in external and internal temperature.

Apparently, this whole phenomenon can work in reverse in parts of the world that experience extremely hot weather. However, stack action is most pronounced where the differences between the interior and exterior temperatures are greatest. For that reason, in Ontario, where internal temperatures are expected to be about 70°F (21°C), there will be a significant difference where the external temperature can be 0°F (−18°C).

While certain other factors, such as wind velocity, can have an effect on stack action, the existence of a fire inside a building can have a dramatic effect. *Local* stack action occurs when the heat of a fire within a room or suite of origin causes the air inside the building to expand and forces gas and smoke into other parts of the building. Although some of the fires that were described earlier in this report took place in the summer, when there was little *natural* stack action because the interior and exterior temperatures were similar, the fire itself caused *local* stack action to occur within a building.

SMOKE CONTROL MEASURES:

Once these researchers had made the basic assumption that smoke movement will follow the normal air movement in a building, they decided that using their understanding of this phenomenon, they could, perhaps, control it. These researchers together with Mr. Grant Wilson of NRC, took part in what Mr. Tamura described as "brainstorming sessions" which resulted in a report to the ACNBC Task Group on High Buildings in 1968. The report suggested the use of certain *smoke control measures*.

When the 1970 edition of the National Building Code was published, an introductory note was added to Subsection 3.2.6, the Subsection which deals with highrise buildings.

> "Experience with high buildings has shown that time required for complete evacuation can exceed that which is considered necessary for the safe egress of all occupants. Studies of the 'chimney effect' and observations of smoke movement in actual fires, have shown that measures for containing a *fire* on any one storey will not usually prevent the *movement of smoke* through vertical shafts to the upper floors of a high building.
>
> This situation may make the operation of elevators unsafe in a fire emergency. Occupants of high buildings, and particularly those on upper floors, may therefore be faced with severe smoke conditions from fires occurring in storeys below them, before their own evacuation is possible.
>
> The Associate Committee is aware of this serious problem. It has drafted new provisions for the National Building Code to increase the safety to occupants of high buildings. This Subsection now indicates essential requirements for this purpose. Additional important provisions that relate to the control of smoke movement are issued separately in the form of a special paper as they represent a departure from existing design practice. These additional recommendations for design are readily available to the construction industry and may be used on a voluntary basis. The Associate Committee will be considering the incorporation of such provisions into the NBC and will be pleased to receive suggestions for their improvement during 1970."[6] (italics added)

In addition to this note, Sentence 3.2.6.1(3) of the 1970 NBC recommended the use of "measures to limit the movement of smoke or hot gases through a building by natural or mechanical means".

In 1973, a supplement to the NBC was published which contained a list of Measures that were based on the ideas originally articulated by the researchers at the National Research Council. The Measures can be described as follows:

Measure A	Fully sprinklered buildings
Measures B & C	Open corridor access to stairs and elevators
Measures D & E	Vented vestibule access to stairs and elevators
Measures D & E	Pressurized vestibule access to stairs and elevators
Measures F & G	Pressurized stair and elevator shafts
Measure H	Fully pressurized buildings
Measure I	Pressurized core (vented fire area)
Measure I	Pressurized core (exhaust system)
Measure J	Pressurized core
Measure K	Spatially divided buildings (vented vestibules)
Measure L	Areas of refuge
Measure M	Residential buildings with balconies
Measure N	Connected buildings

Some of the Smoke Control Measures were designed in order to use the understanding of the effect of pressure differentials. For example, in Measures B and C the corridors are expected to be open to the exterior. The air pressure in the corridor would then be the same as the exterior pressure. In this situation, smoke from a suite of fire origin would not migrate between floors, but would vent directly to the exterior.[7] The most familiar example of an apartment building with exterior corridors in Canada is Habitat, located in Montreal. This building is unique, and was constructed for Expo '67. However, in a Canadian climate, this Measure is not particularly practical.

A number of the other Measures rely on active as opposed to natural pressurization of portions, or in the case of Measure H, of all, of the building. If the pressure is higher in one portion of the building than it is in the fire affected area, then air laden with smoke will not move into the pressurized area.

Some of the Smoke Control Measures do not in fact control the *movement* of smoke, but instead provide life safety by some other means. For instance, Measure A (a fully sprinklered building) controls smoke by controlling the amount of smoke generated, not the movement of it subsequently. In other words, sprinklers control smoke by putting out the fire so that little smoke can be produced.

Another alternative is to have methods of moving occupants to uncontaminated areas of the building. Although these methods are not strictly *smoke control* methods, they have been included in the list of acceptable alternatives which ultimately became the Smoke Control Measures identified in the Supplement to the National Building Code. Measure M, buildings with balconies, and Measure L, areas of refuge, are two examples of this type of method.

At the present time, the NBC would require all high buildings to be designed to limit the dangers to occupants and firefighters from exposure to smoke. Article 3.2.6.2 provides that, two hours after the start of a fire, all floor areas that are above the lowest exit storey should not contain more than 1% by volume of contaminated air from the fire floor, assuming certain temperature factors. This limitation is also extended to the exit stairs and to the firefighters elevator shaft.

In the explanatory material at the end of the NBC, there is the following note:

> "Measures that relate to limiting or controlling the movement of smoke caused by the building fire are described in Chapter 3, 'Measures for Fire Safety in High Buildings' of the Supplement to the NBC, 1980. *Adoption of 1 of these Measures is considered to be an acceptable means of complying with the requirements of this Subsection*. It is not, however, intended that these measures should be regarded as excluding any equally effective measure that may be developed."[8] (italics added)

As explained in Chapter 2, the NBC is a model code. It does not have the force of law unless it is adopted as the law in a specific province. Further, the model code can be adopted in whole or in part, or altered to suit requirements of the authority having jurisdiction.

The OBC became the law of the Province of Ontario on December 31, 1975. With certain exceptions, it adopted the requirement for smoke control which was found in the NBC at Article 3.2.6.2. However, the explanatory material found in the NBC (which adopts identified measures as acceptable means of complying with the requirements for smoke control) was *not* adopted as part of the Ontario Building Code. In effect, the Province of Ontario simply identified a performance standard by providing that the air may not contain more than 1% by volume of contaminated air from the fire floor. It did not identify any specific ways of complying with this requirement. As a practical matter, however, it appears that the use of one of the Measures described in the NBC would probably satisfy most building officials in Ontario that the performance criteria had been met.

Another important difference between the OBC and the NBC was that Ontario decided to exempt apartment buildings from the requirement to provide smoke control measures, with the exception of smoke control in a firefighter's elevator shaft. In making this decision, it is my understanding that the Province of Ontario was content to rely upon the advantages of compartmentation in apartment buildings.

As Mr. Tamura explained, most of these Measures were designed as a result of "brainstorming sessions" among a number of researchers at the National Research Council. Until the recent fire at the First Canadian Place, the Inquiry was advised that there had been no record of any fires in Canada taking place in buildings equipped with Smoke Control Measures using air pressurization. Certain of the witnesses at the Inquiry were sceptical about the use of methods which might be supportable in theory, but have not been proven in practice.

For instance, Dr. John Bryan, commented:

> "At the present time the state of the art of smoke control, which is still an art rather than a science, I'm afraid that too many times we are depending on the people that can't keep this room comfortable to remove the smoke from it when you have a fire."[9]

One of the major reasons that the Fire Research Station at Almonte was built was to allow researchers to gain experience with Measures using pressurization in a controlled test environment. I can appreciate that, without such a facility, it would be extremely difficult to perform actual experiments in order to verify the measures.

Mr. Tamura discussed two limitations on the theory which forms the basis of the active Smoke Control Measures. First, because the mathematical model is based on the study of normal air movement in highrise buildings, it does not adequately consider the effect of the heat of a fire which causes local stack action. This variable will be studied in the Fire Research Station at Almonte. Second, the mathematical model which was developed by Tamura and McGuire, and which was used in the development of the Smoke Control Measures, is based on tests conducted in actual buildings. However, those buildings were open area, commercial buildings. Although Mr. Tamura explained that his results would be somewhat different if he had tested compartmentalized buildings, such as apartments and hotels, without actually performing these tests he was unable to quantify the difference. He could only agree that if a fire took place within a compartmented area, he would expect less contamination in other parts of the building after five minutes than he would in an open concept building. He intends, in the future, to examine the effect of compartmentation by doing similar experiments in actual compartmented buildings.

Recommendation:

7.1 The exemption granted for apartment buildings in Sentence 3.2.6.2(10) of the Ontario Building Code from the requirement to have smoke controlled between floors and in exit stairwells should be removed.

In Chapter 3, I have recommended that all exemptions for apartment buildings presently allowed by the OBC should be eliminated.[10] I have addressed myself more specifically to smoke control in Recommendation 7.1.

The decision to allow highrise apartment buildings in Ontario to be built without smoke control measures is a variation from the model building code. However, it was my understanding that the policy of the Building Code Branch in Ontario was to maintain uniformity with the NBC unless some reason presented itself which would support variation.

George Tamura discussed the effect of compartmentation in highrise buildings. Although he intends to study actual compartmented buildings in the future, he advised the Inquiry that the heat of a fire has a significant effect on smoke movement.

> "As temperature rises, the gases expand. And when the temperature reaches about 1,000°F, two-thirds of the gas must be displaced into adjacent areas. . .or outside the fire compartment.
>
> And when the fire temperature reaches a steady state condition. . .the force caused by the difference in temperature of the fire compartment and the temperature in adjacent spaces such as stairwells and elevator shafts [causes local stack action]."[11]

Some witnesses suggested that the impact of compartmentation upon smoke movement has not been adequately examined by the drafters of the National Building Code.[12] However, it is clear that the issue has been addressed at the national level. A comment in the Supplement to the National Building Code reads as follows:

> "Compartmentation: Where a floor area is divided into a number of fire compartments, the potential size of a fire will be limited to the contents of 1 compartment. In addition, there will be, in some circumstances, dilution of smoke moving from the fire compartment to other floors.
>
> Where the fire occurs below the neutral plane, in cold weather the path of smoke travel may be along a corridor to stair and elevator shafts. In this case, the smoke in the corridor will be diluted by clean air coming from other compartments. In an ideal situation (uniform compartments, no expansion and no wind), dilution of the smoke laden air will be in proportion to the number of compartments. Breaking of a window in the fire compartment will, however, increase the pressure in that space and will reduce the effect of dilution.
>
> Where smoke travel occurs through a vertical shaft from a compartment involved in fire to higher compartments, the level of contamination will not be related to the number of units on one floor, but will likely be restricted to units on other floors that are adjacent to the vertical shaft.
>
> *The result of compartmentation is, therefore, likely to be beneficial, but does not eliminate the need for smoke control measures.*" (italics added)

Mr. Donald Boehmer, Vice-President and Manager of Rolf Jensen and Associates, believes that the exemption of apartment buildings from smoke control requirements is justified. He relies very strongly on the compartmentation concept as an effective means of providing fire protection within a building. In his view:

> "It's very difficult to get a sustained fire condition within a small compartment, because it becomes ventilation-controlled and the fire basically becomes self-extinguishing. . .you typically don't have the circulation between apartment units, so you have a much more compartmentalized mechanical air handling system within the building. . .On the basis of the fire protection concept that we should be using for residential buildings — and that is the high degree of compartmentation — we should be containing the fire to the apartment of fire origin, and you shouldn't really have to additionally protect the other people within the building."[13]

On the other hand, Mr. John Fothergill had a very different view. Mr. Fothergill is associated with an American company called Integrated Systems Incorporated. That company has done a great deal of work in the United States for such agencies as the U.S. Fire Administration and the Consumer Products Safety Commission. He has tested air movement in actual apartment buildings, using tests which appear similar to those planned by George Tamura.

He held very strong views that compartmentation does not effectively contain toxic elements, *particularly* in residential buildings. The reasons for this, he says, are poor construction, poor maintenance and poor design. He has found that there is substantial air movement in existing buildings, and that the paths of air movement are very complex and insidious. He added that in a normal situation in residential buildings, some people will have balcony doors or windows open while others may have them closed. This will have an effect on the amount of air movement.

Dr. John Bryan, of the University of Maryland, held a view rather similar to that of Mr. Fothergill. He stated that:

> "Compartmentation is an architectural concept, never achieved in a functional building. . .you can design it. It is done all the time. . .but it isn't achieved in practice. . .even if you get it at the time of occupancy, within two years you won't have it because of the modifications."[14]

The NBC has never exempted apartment buildings from any of the smoke control requirements for high buildings. Mr. Graham Adams, the former Director of the Building Code Branch, testified that it was the policy of the Building Code Branch that the OBC should be consistent with the NBC unless there was evidence to justify a difference. Having regard to the research and expertise involved in drafting the model code, this policy seems eminently reasonable. It was my impression that some witnesses who advocated compartmentation provided adequate smoke control within apartment buildings were not completely convinced of that position. For this reason, and because of the conclusion I have made that there is insufficient evidence that compartmentation will adequately control smoke migration outside the room of fire origin, it would be contrary to the policy of the Building Code Branch as stated by Mr. Adams to allow the exemption to continue.

The impact of a requirement to provide smoke control in highrise residential buildings will be slight having regard to the acceptability of balconies as an alternative to controlling the movement of smoke.[15]

All of the foregoing supports my recommendation that compartmentation cannot, at the present time, be reasonably considered an alternative to smoke control measures, and that there is a need for further study not only of compartmentation, but also of methods to improve construction techniques so that the theory of compartmentation can be more reliable in practice.[16]

One matter that might be considered is the use of unitized bathroom exhausts to remove air directly from individual rooms or suites to the exterior. The Inquiry heard evidence that such exhausts have been installed in some apartment buildings. Bathroom vents are usually connected to a common vertical riser which has been identified as a common path of smoke migration. If practical, the introduction of unitized exhausts would eliminate the common riser, and thereby remove one potential path of smoke migration throughout the building. The same application could be used for kitchen vents.

I add that the experience in many of the fires described in Chapters 3 through 6 indicates that while compartmentation has been effective in containing *fire*, the containment of smoke and other toxic gases essential to ensure life safety in high buildings has not been achieved.

SMOKE CONTROL IN PRACTICE:

One of the earliest critiques of the smoke control measures was done by Gerhard Granek in 1970, before the measures were identified in the Supplement to the NBC.[17] This criticism was done in response to an explanatory paper released by NRC which was, in effect, the report to the ACNBC Task Group on High Buildings prepared by McGuire, Tamura and others in 1968.

In no sense could Mr. Granek be considered an opponent of smoke control measures. He has had a great deal of experience in designing systems in buildings such as the Commerce Court, the First Canadian Place and the Eaton Centre in Toronto.

His major criticism in 1970 was that there were no standards established for new equipment or hardware, for methods of implementation, or for inspection. He was concerned that enforcement might not be uniform. He also discussed the increased level of training which would be necessary for the design professionals, the fire service and building operators. Finally, Mr. Granek pointed out in 1970 that some of the methods of smoke control discussed in the explanatory paper mentioned hardware that had not yet been designed or approved for use.

Every one of the issues raised by Mr. Granek 13 years ago was the subject of comment at this Inquiry.

It is apparent from Mr. Granek's paper that in the original explanatory paper the descriptions of specific measures included information about the application of each method. For instance, "where almost all the occupants of a building are sleeping", two methods were described as being most appropriate.

Similar information was included with the Smoke Control Measures when they were finally published in the Supplement to the National Building Code. Notes accompanying the description of each Measure indicate that the Measure meets the smoke control requirements for certain major occupancies, regardless of the design of the specific building. On a plain reading of the model code, the installation of a specific Measure (if the Measure is identified for use in a given occupancy classification) in *any* building of that occupancy classification, is *deemed* to be compliance with the requirement to provide smoke control.

The approach taken by the Province of Ontario in the OBC has been quite different. The OBC identifies a pure performance standard without describing the specific measures at all.

There are two ways of approaching the codification of requirements for smoke control, and each method has its proponents.

On one hand, one can design a specification orientated or "prescriptive" code. The code would say, in effect, in *this* type of building, use *this* system and build it *this* way. Those in favour of a prescriptive code would argue that most highrise buildings have similar designs and that certain methods are commonly applicable. For instance, in the descriptions of the fires in Chapter 3, I have been able to describe some apartment buildings as being typical in design, and have felt certain that readers will visualize a double-loaded central corridor with stairwells at either end and elevators at the mid point. To require a special design in every case is uneconomical and inefficient. Further, with this kind of code, building inspectors can evaluate systems easily and enforcement would be uniform. This method emphasizes certainty.

On the other hand, a pure performance standard is meant to require that, in every case, both the designer and the inspector must be satisfied that the system as installed in a specific building will work in that building. The highest value addressed by such a standard is safety rather than certainty. A pure performance standard is the only way to require a sufficient degree of safety in atypical buildings. It is necessary in these buildings to provide an engineered solution. In these cases, care will have to be taken to design a method of testing the system on completion. Very complex testing procedures were undertaken in the Commerce Court and the Eaton Centre in order to satisfy the designers and the Building Officials that the system would work.

Recommendation:

7.2 The Ontario Building Code should identify smoke control measures that have a high degree of reliability for specific types of typical highrise buildings.

The positive values of both prescriptive and performance codes can be achieved if persons designing and inspecting typical buildings are given guidance, while those creating unusual buildings are required to put their minds to an engineered solution. Only those Measures having a high degree of reliability should be identified. They should not, however, be mandated, even in typical buildings. Although it may not often be used, designers of typical buildings should retain the freedom to design other systems or adapt other measures. For example, Mr. Granek explained that in highrise apartment buildings it is common for air to be introduced into the corridors as a means of keeping odours from individual suites from migrating into the corridors. In a fire situation, if the amount of air pressure could be increased it might prevent or limit smoke migration from the suite of fire origin. Further, as research is done at the Almonte Field Station, and reliability established for other methods, they can be added to the Measures identified in the Ontario Building Code.

Evidence heard by the Inquiry suggests that a code drafted in accordance with this recommendation would reflect common practice.

During the Inquiry a study of the Smoke Control Measures identified in the NBC was completed and made available to the Inquiry (Exhibit 119). This report was prepared by Dunlop, Farrow and Aitken (Architects, Engineers) for the Building Code Branch, Technical Standards Division, of the Ontario Ministry of Consumer and Commercial Relations. The principal author of this report was Christopher T. Fillingham, and the Inquiry had the benefit of his evidence regarding this report. For ease of reference, I will refer to this report as the "Fillingham Report". The Report deals primarily with the application of Smoke

Control Measures to new commercial buildings including hotels. It is important to note, however, that many of the observations and conclusions in the report might be applicable to highrise occupancies, generally.

The Smoke Control Measures were assessed for reliability in the Fillingham Report. A similar assessment can be found in a separate study done by Tamura and McGuire. Each assessment was done using slightly different criteria for measuring reliability.

The Fillingham Report used the following reliability criteria:

> "*The Dependence of Mechanical Reliance:*
> To determine the amount of reliance upon a mechanical/electrical power.
>
> *The Complexity of the System Required to Achieve Results:*
> To determine the relative number of mechanical/electrical components that must function or interact to achieve results.
>
> *The Complexity of User Knowledge Expected:*
> To measure the level of "special knowledge" of a system required by the fire service.
>
> *Dependency on Emergency Power:*
> To measure the ability of the smoke control measure, to achieve design results in the event of a power failure.
>
> *Redundancy:*
> To measure the inherent capability of the smoke control measure to achieve contributing life safety features beyond the designed results.
>
> *Design/Installation Experience:*
> To determine the extent of the actual use history of the measure.
>
> *Testing/Maintenance Experience:*
> To determine the use history with the commissioning of the measure and the maintenance standard of the Ontario Fire Code.
>
> *Response of Occupant:*
> To assess the measure in terms of the apparent complexity of occupant behavior required.
>
> Recent studies involving an analysis of occupant behavior indicates that panic may not be what we have historically perceived it to be. It is becoming apparent that people do what they understand to be "the thing to do", and then are in potential trouble when they meet the unexpected (for example clawing at locked doors, searching smoke filled corridors for exit doors). It appears that their response is rational except when their expectations are not met. This criteria intends to establish if the response requires special knowledge or expected action which may not be realistic in terms of actual emergency conditions.
>
> *Suitability to Building Occupancy:*
> To assess the measure in terms of its application and impact on the type of construction, compartmentation quality, normal use of the building, and management of the building. To determine whether in fact some of the measures are practical at all."[18]

Using these criteria (and also a set of "objective criteria") the authors of this report evaluated the measures and ranked them. They did not include a ranking of Measures B and C (open corridor access to stairs and elevators), because these measures are not practical in the Ontario climate. The evaluation of Measure M (building with balconies) was limited to "commercial" buildings used as hotels. There is no experience with the use of balconies in other types of "commercial" buildings.

Because the Fillingham report was concerned only with commercial buildings, the evaluation was broken down into two categories. The Measures are ranked in order of reliability as defined in the report.

"*Evaluation of Measures — Groups D & E*
(Office and Mercantile[19]

A	Fully sprinklered building
D, E	Vented vestibules
K	Divided building — vented vestibule
D, E	Pressurized vestibule
G	Pressurized shafts — under 75 m
K	Divided building — pressurized vestibule
I, J	Pressurized core
H	Fully pressurized building
F	Pressurized shafts — under 75 m
L	Areas of refuge"

"*Evaluation of Measures — Group C (Hotels)*[20]

A	Fully sprinklered building
M	Balconies
D, E	Vented vestibules
K	Divided building — vented vestibule
D, E	Pressurized vestibule
K	Divided building — pressurized vestibule
I, J	Pressurized core
G	Pressurized shafts — under 75 m
F	Pressurized shafts — over 75 m
L	Areas of refuge"

The evaluation done by Tamura and McGuire used slightly different criteria which were also subjectively developed by the writers.

> "For a smoke control measure to achieve the greatest reliability the following should be avoided:
> 1. Dependence on hydro power.
> 2. Dependence on accurate identification of the area of origin of the fires.
> 3. Sophistication."[21]

These writers did not evaluate either Measure A (Sprinklered building) or Measure M (building with balconies) in designing their "reliability merit sequence". They gave the following reasons:

> "Measure M will. . .not be compared with the remainder because it differs from them in not specifically permitting the occupants of the building to vacate it. Provision of balconies can nevertheless prove quite an effective life safety measure although some exposure to smoke may prevail and, in the depths of a Canadian winter, exposure to exterior temperatures may be a significant hazard.

> In the opinion of many, Measure A — complete sprinklering, would rank as the most effective and reliable. Sprinklers have, in fact, a very good record of reliability in controlling fires and, by limiting the amount of combustible involved in fire, also restricts smoke production. As it constitutes both a crude detection system and a firefighting measure that is automatically initiated early enough in a fire, a sprinkler system should enhance the effectiveness of fire department operations.
>
> A sprinkler system minimizes smoke problems by limiting the generation of smoke. All the other Measures achieve this objective by influencing the choice of flow paths followed by the smoke. For this reason no further attempts will be made to compare the merits of sprinklers with the other smoke control measures listed in the Code."[22]

The reliability merit sequence developed by McGuire and Tamura follows:

Merit Ranking	*Measure*[23]
1	B & C Open corridor access
2	K Divided building (Spatial separation and vented vestibules)
3	K Divided building (others)
4	D & E Vented vestibules
5	F & G Pressurized shafts
6	I Pressurized core (vented fire area)
7	I Pressurized core (exhaust system)
8	D & E Pressurized vestibules
9	J Pressurized core
10	L Areas of refuge
11	H Pressurized building

Based on the foregoing information, it is my view that Measures B & C, D & E (vented), K, M and A can be identified as having a high degree of reliability. As stated earlier, as research is done at the Almonte Field Station and reliability established for other methods, they can be added to the Measures to be identified in the Ontario Building Code. For example, Mr. Tamura explained that there are design limitations on Measures F and G, pressurized shafts. If one is pressurizing a stairwell shaft that is over a certain unspecified height, the amount of air pressure needed in the shaft can make it very difficult to open stairwell doors. At present, it is necessary to use an engineered solution to overcome the difficulty, and there may be cases where this Measure is totally impractical. Perhaps work done at Almonte will result in the addition of sufficient information about this Measure, that it can be considered reliable in specific circumstances.

Measures B and C:

In order to comply with Measures B and C, buildings must be built with exterior walkways or permanently vented corridors. While this measure can be considered extremely reliable, it is generally impractical in the Canadian climate.

Measures D and E:

Measure D and E would provide protected vestibule access to stairs and elevators. Smoke would not be able to enter the stairwell shaft or the elevator shaft because vestibules enclosing the doorways to those shafts have vents to the outdoors (vented vestibules) or have air injected into them (pressurized vestibules). In pressurized vestibules, the air pressure in the vestibule is greater than that in the rest of the floor area, thereby preventing smoke from entering the vestibule.

Below the neutral plane, natural stack action will cause the pressure in a vented vestibule to be greater than that in the rest of the floor area, thereby preventing smoke from entering the vestibule. Vented vestibules located above the neutral plane will have a lower air pressure than the rest of the floor area. As a result, smoke will move into the vestibule and out the vent to the exterior. In all cases, the result is the protection of the elevator shaft and stairwells.

Measure K:

In Measure K the building is divided in two. If one side of the building became untenable due to smoke conditions, persons could move to the other side of the building by passing through vented or pressurized bridges or vestibules. These bridges or vestibules are provided at intervals not exceeding five floors.

Measure M:

Measure M is the provision of exterior balconies, and is most common in apartment buildings.

Recommendation:

7.3 The Ontario Building Code should accept the use of exterior balconies at any height as an alternative to providing smoke control. Clause 3.2.6.2(8)(a) of the Ontario Building Code, setting out a height restriction of 120 feet in regard to the use of balconies as an alternative to providing smoke control should be deleted.

The Inquiry was advised that most highrise apartment buildings are being built with balconies. With certain height limitations, in highrise apartments and hotels, the OBC accepts the use of balconies as an alternative to having a system which actually controls smoke movement within the building.

In the past, the NBC, both in the text and in the description of Measure M, imposed a similar height restriction for the use of balconies as a Smoke Control Measure. The Inquiry was advised that the 1983 change series of the NBC will delete the height restriction for the following reason:

> "The fire experience indicates that for residential buildings of this type, with their high degree of compartmentation, the height limit is not justified."[24]

The proposed amendments to the OBC as presented to the Inquiry by Mr. Graham Adams has retained the height restriction on the use of balconies as an alternative to providing smoke control.[25]

If this recommendation is accepted, designers will have the option of complying with the requirements for smoke control in apartment buildings of any height by using balconies. As a practical matter, it must be understood that due to wind and weather conditions, balconies will probably not be used for extremely high apartment buildings.

Recommendation:

7.4 A determination should be made of the acceptability of enclosed balconies as "exterior balconies" for the purposes of Ontario Building Code Clause 3.2.6.2(8)(a).

Enclosed balconies are becoming more common in apartment buildings. It is very likely that enclosed balconies will not afford sufficient separation from the suite to be regarded as an area of safety. It is my recommendation that Code committees consider this new trend in balcony construction and decide what elements, if any, must be included before enclosed balconies are accepted as an alternative to having smoke control. For example, both the NBC and the OBC stipulate the size of balcony which is acceptable as an alternative to providing smoke control. Small, ornamental balconies which exist on some hotels would not be satisfactory for this purpose. If satisfactory elements are prescribed for enclosed balconies, then this type of balcony could be acceptable as an alternative to providing other smoke control.

I am concerned that in some recent highrise apartment fires, some occupants have not used balconies as an area of safety when it appeared that the use of the balcony would have prevented injury and death. Further comment about this matter is found in Chapter 13.

Measure A:

In their study, Tamura and McGuire commented that Measure A, complete sprinklering of a building would, in the opinion of many, rank as the most effective and reliable Smoke Control Measure. Measure A was given the highest reliability ranking in the Fillingham Report.

SPRINKLERS:

There was a great deal of evidence about the use of sprinklers as a means of controlling *fire*. Sprinklers can only be considered as a Smoke Control Measure (Measure A) if a building is fully sprinklered. In my view, even the installation of a complete sprinkler system in an *atypical* building should not be assumed to satisfy the requirements for smoke control. Gerhard Granek testified that, in certain buildings, he considered the installation of sprinklers as a base for smoke control, only. Mr. Tamura advised that in some multi-storey buildings other smoke control methods are combined with total sprinklering because of the possibility of smoke generation. It is for this reason that I have not recommended the adoption of the codification method used in the NBC, that is, the acceptance of a specific measure in *any* building regardless of design.

For the purposes of the following discussion, one must keep in mind that the installation of sprinklers *in a portion* of a building will not qualify as a Smoke Control Measure. Sprinklers can be installed in a certain portion of a building if that area is identified as a high risk area in terms of fire propagation. Whether an area is considered a high risk area depends upon a number of criteria. One might consider the size of the area, and the type and amount of the fire load. Whether the area is generally used by large groups of people can influence the decision, because this raises the probability of fires occurring and puts more people at risk. If the area is close to a sleeping occupancy it could be considered more dangerous. If the area is typically unoccupied for long periods of time, fires could go undetected. Finally, one must consider the actual fire experience in similar areas.

Two questions arose time and time again throughout the Inquiry. Should the present mandatory requirements for sprinklers in new buildings (OBC Article 3.2.6.6) be extended? Should existing highrise buildings be required to have sprinklers as a retrofit measure?

In Chapter 10, I have made comments and recommendations regarding the retrofitting of highrise buildings with sprinklers. Much of what was concluded in Chapter 10 rests upon the general discussion of sprinklers which appears in this Chapter. The discussion in this Chapter deals primarily with sprinklers for new buildings.

The two questions posed above require a brief historical review of the treatment of sprinklers in codes. Later in this discussion, I will consider their effectiveness as a means of controlling fire and smoke. Inherent in this consideration is an evaluation of whether sprinklers can, given our present knowledge, be compared with other Smoke Control Measures not only as to their effectiveness but also as to their cost.

History of Sprinklers in Codes:

> "Some critics of present codes consider that there has been too much influence from the insurance industry's traditional property protection with the result that there is too much emphasis on reducing fire spread in buildings to save property damage and that these codes should be rewritten for life safety purposes as well.
>
> This is an active controversy among code writers and their critics. The long assumed notion that control of fire spread was synonymous with life protection was dispelled with recent realization that control of fire spread did not necessarily mean control of the gases produced by fires.
>
> * * *
>
> The high-rise building fire problem began to reveal itself as a world-wide concern during the 1960's with the experience of serious fires in the increasing numbers of tall curtain wall buildings.[26] Spectacular fires attracted the attention of both the fire protection community and the public. The key fact that became evident was that the modern tall building was structurally fire resistive, but smoke and gases often spread through the structure endangering lives and making fire fighting difficult. Added to this was the fact that traditional emergency exit concepts did not work in such situations. Fire fighters were faced with substantial fires in large floor areas of centrally air conditioned buildings and difficult logistical problems in getting to high fires.
>
> Pioneering work in developing requirements recognizing the special life safety problems in high-rise buildings was carried out in Canada by the National Research Council and the 1970 National Building Code introduced additional requirements for high buildings pertaining to improved detection, alarm, and control and to improved exiting including voice communication and elevator requirements.
>
> Mention was also made at that time of the voluntary use of design guidelines for smoke control.

> In 1973 the National Building Code introduced major revisions to these additional requirements by [introducing] requirements for smoke control."[27]

A recent development that should be noted is that in early 1983, the Part 3 Standing Committee of the NBC requested the Division of Building Research to prepare a paper recommending action on the question of mandatory sprinklering of buildings in general (Exhibit 306).

There are numerous provisions of the OBC referring to sprinklers. Basically, those provisions fall into two categories:

1. Provisions which mandate sprinklers in particular areas, and
2. Provisions that allow for less restrictive fire protection requirements in structural aspects of building construction in exchange for the installation of automatic sprinkler systems. Such regulatory concessions are commonly called "trade-offs".

Mandatory Code Requirements for Sprinklers for Each Occupancy:

Recommendation:

7.5 The Ontario Building Code should require all highrise buildings to be sprinklered throughout except for the residential areas (including halls and corridors) of Group C occupancy buildings, and office or mercantile spaces in those Group C occupancy buildings where the floor area of those spaces is divided into fire compartments not exceeding a specified size. The area chosen should not exceed 7500 square feet.

The major provisions of the OBC which mandate sprinklers in high buildings are found in Subsection 3.2.6 "Additional Requirements for High Buildings". Sentence 3.2.6.6(1) states:

> PROVISION OF SPRINKLERS
>
> 3.2.6.6(1) The following spaces shall be sprinklered:
>
> (a) every storey, or part thereof, intended for a Group E or Group F, Division 1 or Division 2 occupancy;
> (b) every restaurant or licensed beverage establishment;
> (c) every storey or part thereof intended for storage or handling of hazardous substances;
> (d) every floor area exceeding 15,000 sq. ft. except,
>   (i) when the floor area is divided into fire compartments not exceeding 15,000 sq. ft. in area and separated from the remainder of the floor area by fire separations having at least 1-hr. fire-resistance rating, or
>   (ii) when the floor area is intended for a Group C major occupancy apartment building.

This provision does not require any part of a highrise building which is less than 15,000 square feet (1390 square metres) and which is used for offices, mercantile, or assembly purposes other than a restaurant or licensed beverage establishment to be sprinklered. The proposed amendments to the OBC do not change this section, even to bring it in line with the NBC which stipulates a somewhat smaller area (1000 square metres).

This recommendation would, in effect, require all new highrise office buildings, mercantile buildings and institutional building to be sprinklered throughout. It would also mandate certain open spaces (over a specific size) in apartments and hotels to be provided with such protection.

Office and Mercantile Buildings

The view that was expressed by many, and the office industry in particular, was that the statistical fire record for highrise office buildings is exceptionally good, and does not justify the mandating of sprinklers. Those taking that position submitted that much of the highrise office stock included in the statistical fire record was constructed before 1975 and as a result, do not have Smoke Control Measures, and in particular, do not have sprinklers. They state that when the fire record in highrise office buildings is considered in light of these submissions, it indicates that sprinklers are not necessary in those highrise occupancies.

Those who believe that sprinklers need not be mandated for highrise office buildings suggest that the present fire safety record in those buildings is due to early detection provided by people who are "alert, and generally distributed throughout the building", and that this early detection results in rapid extinguishment.[28]

Commission Counsel submitted that the reason for the present fire record in highrise office buildings is not clear. It could be based on either detection and/or the existence of sprinklers. Based on his analysis of Appendix E to Brief 34 submitted by BOMA, the present fire record in highrise office buildings could be regarded as due to early detection and sprinklers on a 50/50 basis.

It is my view that the issue of mandatory sprinklers in highrise office buildings cannot be decided on a consideration of the statistics alone. As stated in Chapter 1, any decision regarding fire safety must take into account basic principles of fire safety, and include a consideration of the consequences of fires, and not merely the risk or likelihood of a serious fire occurring. Even the evidence of those who did not advocate sprinklers for new highrise office buildings indicated that the reliance on statistics alone was not sufficient, and that the potential for tragedy must also be considered.[29]

It is my opinion that the evidence relating to the basic principles of fire safety, and the issue of risk outweighs the submissions based solely on statistics. Therefore, the mandatory installation of sprinklers in highrise office buildings is justified. Further consideration will have to be given in many buildings as to whether the installation of sprinklers will in fact satisfy the requirement for smoke control in that building.

The conclusion that sprinklers be mandated for highrise office and mercantile buildings is supported by the Fillingham Report. After an extensive review of the various Smoke Control Measures in the supplement to the NBC, that report states:

> "This study has reached the conclusion that the most effective method of limiting danger to the occupants of high commercial buildings is to limit the size of the fire.
>
> Limiting the size of the fire, either by means of effective compartmentation such as the rooms or suites in hotels or a direct suppression system, such as sprinklers, has an impact on reducing the amount of smoke produced which may travel through all parts of the building."[30]

As I understand this Report, it concludes that the degree of compartmentation of highrise office buildings is not sufficient to achieve the basic fire safety goal of limiting the size of the fire. This conclusion was an important factor in the recommendation that the suppression option be mandated for highrise commercial buildings.

Further support for this recommendation came from Mr. Gerhard Granek and Mr. George Tamura. Both men are highly experienced in the theoretical and practical application of various smoke control measures. Mr. Granek testified that in highrise office buildings he would, in most cases, identify sprinklers as a base system for smoke control. Even when speaking of highly compartmented apartment buildings, Mr. Tamura stated that once the building was above a certain height, he would advocate sprinklering throughout.

It is my view that the economic impact of this recommendation will not be significant. This conclusion is supported by the evidence. A review of the Smoke Control Measures being employed in Ontario highrises indicates that Measure A (Sprinklers) is already the method of smoke control most frequently used in typical highrise office buildings, and sprinklers together with other Smoke Control Measures are used in atypical office buildings.

A study conducted in Alberta[31] found that the choice of one measure over another would not have a significant impact on overall building costs. Finally, Mr. Donald Boehmer, a witness for the office industry, stated that for new apartment buildings which were designed without balconies, sprinklers would be the most cost effective Smoke Control Measure. The evidence indicated that the cost of sprinklering a new apartment building is greater than that for sprinklering an open-concept building.

Hotels

With the exception of restaurants and licensed beveraged establishments, the OBC does not require open areas of hotels which do not exceed 15,000 square feet to be sprinklered. I have already recommended that Article 3.2.6.6 be amended to require certain non-residential areas of a hotel to be sprinklered.[32] The Fillingham Report identifies three common features of hotel fires which have resulted in a high loss of life. They are:

> "1. Combustible interior finish and furnishings permitted the propagation of flame and gases.
> 2. Unenclosed vertical openings, usually stairways; and large, undivided floor areas, permitting the spread of flame and gases, and
> 3. The absence of a fire alarm, sprinkler, or detection equipment. . . .
>
> From the fire experience record, it is evident that multiple-life loss fires in hotels were caused by the unchecked and rapid spread of fire in subsidiary occupancies creating untenable conditions of heat and smoke to occupants in the residential occupancy. The efforts of firefighters to undertake the firefighting and search and rescue operations were frustrated by the rapid fire spread and tremendous smoke development."[33]

In Ontario, the fire at the Inn on the Park where the Tower Room was the room of fire origin, and the fire at the Las Vegas MGM Grand Hotel where the fire spread rapidly in the Casino area, are examples of the consequences of unchecked fire and smoke in large, open areas. The evidence strongly suggested that had those areas been sprinklered, the loss of life and property would have been reduced substantially.

It is my view that the hotel suite, or guest room and hall and corridors adjacent thereto, need not be sprinklered on a mandatory basis. Guest rooms and suites form fire resistive compartments which are effective in limiting the spread of *fire*. To require sprinklers in all of these areas would be very expensive. The evidence indicates that it is not cost effective to sprinkler such areas of hotels unless it is the means by which the designer chooses to comply with the smoke control requirements of Article 3.2.6.2.

Apartment Buildings

It is my view that the mandating of sprinklers in the residential areas of highrise apartment buildings and other Group C occupancy buildings is not warranted. Apartment suites, like hotel guest rooms, are designed to restrict the spread of fire through compartmentation.

Earlier in this chapter I have recommended that the exemption of apartment buildings from the requirement to have smoke control be removed. The method of complying with such a requirement, whether by the use of sprinklers or some other method, should be left to the designer.

Institutions

Recommendation 7.5, which mandates sprinklers for new institutional buildings, includes institutional occupancies because of the number of non-ambulatory patients in hospitals and the potential difficulties of rapid evacuation of both highrise hospitals and correctional facilities.

It is recognized that there may be some practical problems in implementing this recommendation. For example, when a building is sprinklered pursuant to the OBC, NFPA 13 is the installation standard which applies. Mr. Granek was concerned that if that standard was applied to hospitals without any exceptions being made, areas such as operating rooms would have to be sprinklered. He had grave reservations about sprinklers in operating rooms. Further, those in charge of facilities where persons are being confined might have concern regarding the accessibility of sprinkler hardware to the detainees. I therefore comment that in dealing with my recommendation that institutional buildings be sprinklered, consideration must be given to the areas of the various types of Group B Occupancies that should not be sprinklered.

Mandatory Sprinkler Provisions in Other Provinces:

A review of legislation in various provinces in Canada revealed that in some provinces, sprinklers were mandatory for certain highrise occupancies. I present, in chart form, a summary of the significant portions of the provincial legislation (other than Ontario) relating to this issue.

Province	**Occupancy and Height**	**Effective Date**
Saskatchewan[34]	— Apartments or hotels over five storeys — hospitals or institutional buildings over three storeys — special care homes over one storey.	Applies to buildings converted to or constructed for these uses after March, 1979.

Nova Scotia[35]	— Assembly, institutional, mercantile and residential buildings three storeys and higher — Office buildings four storeys and higher — All of the above occupancies under three storeys if containing very large open areas.	Applies to building conversions, additions or construction after January, 1976.

Trade-offs:

The instances where substitution of sprinklers is permitted in lieu of complying with Code requirements in the OBC were listed for the Inquiry by Mr. Graham Adams (Exhibit 120).

There was no evidence that the present trade-offs are excessive. There was concern, however, voiced by a number of witnesses, that these trade-offs should not be extended. The issue of further trade-offs was of major concern to the Ontario Concrete Block Association and Canadian Portland Cement Association. These two firms are involved in the manufacture/sale of construction materials which are used in buildings, and which play a part in complying with the requirements for certain construction elements to have fire resistance ratings. The thrust of their submission was reflected in the brief of the Canadian Portland Cement Association (Brief 44) where it states:

> ". . .major structures, fully sprinklered, do not warrant significant reductions in key fire resistant features because redundancy is necessary should sprinklers become inoperable through damage, abuse or other causes. It is simply not prudent to ignore these possibilities. . .This Association strongly supports fire ratings as presently required and supports the use of sprinklers to raise the levels of safety in highrise buildings. Trade-offs of fire ratings against sprinklers are viewed with alarm for the reasons stated."

The sprinkler industry, through CASA (Brief 4) and UA Local 853 (Brief 27), advocated additional trade-offs be allowed for sprinklers. In addition, reductions in the requirements of some provisions of the OBC were recommended in the Fillingham Report if sprinklers were made mandatory (Exhibit 119).

I do not believe that this Inquiry has the expertise, nor do I believe the Order-in-Council contemplated that the Inquiry would deal with the minutia of technical issues such as those involved in a discussion of the merits of specific trade-off provisions. I will, therefore, not comment in detail on the recommendations made for or against additional trade-offs for sprinklers. I have confidence that the code-writing committees have the expertise and representation to adequately deal with this difficult question. Having better statistics about sprinklers as referred to in Recommendation 1.4, would assist the code-writing bodies to make appropriate decisions on a sound statistical basis.

Effectiveness:

In order to determine the cost effectiveness of sprinklers in comparison to other Smoke Control Measures, one would have to be able to rank the Smoke

Control Measures in terms of their dollar cost and their effectiveness in protecting occupants from smoke.

In November of 1982, a cost comparison study of "Alternate Smoke Control Measures for Highrise Buildings" was prepared for the Government of Alberta.[36] That report compared the cost of sprinklers against all other Smoke Control Measures identified in the NBC for an office building, apartment building, and a hospital. The report considered the original installation cost only. It did not compare the cost of maintenance or replacement, or possible lost or gained rentable space. With these limitations, the summary report of that study concluded that there would not be a significant difference in overall building cost regardless of which Smoke Control Measure was chosen.[37]

Although it is possible to rank the various Smoke Control Measures in terms of their actual costs, with the present data it is impossible to rank them in terms of their effectiveness. This is so because there is little experience regarding the performance of Measures (other than sprinklers) in fire situations[38]; and perhaps more importantly, it is difficult, if not impossible, to compare the effectiveness of the various Measures when they are, by design, intended to deal with the problem of smoke in different ways. For example, sprinklers limit smoke production, pressurization methods control movement of smoke, and balconies perform neither of these functions — they merely provide a smoke-free area outside the building.

The attempts that have been made to assess the Measures in terms of their effectiveness illustrate the difficulty of the task. For example, the Terms of Reference for the Fillingham Report required a consideration of the Smoke Control Measures as applied in new commercial buildings. Further, the report was to "establish a cost-benefit relationship between any increase in cost and the resulting increase in fire safety in new commercial buildings where smoke limitation measures are provided."

The authors of the Fillingham Report concluded that in terms of the ability of sprinklers to perform certain functions in comparison to other smoke control measures, sprinklers were given the highest ranking. To determine the effectiveness of the various Smoke Control Measures in providing smoke control, the ability of each Measure to limit the size of the fire, control the movement of smoke, and provide areas of refuge from smoke would have to be analysed. If other factors were considered the resulting ranking would not list the measures only in terms of their effectiveness in controlling smoke. As a result, the ranking could not be used to do a "cost-effectiveness" analysis. When considering the ability of the various Smoke Control Measures to perform certain functions, the Fillingham Report did not restrict the analysis to the Measures' ability to limit the size of the fire, control the movement of smoke, and provide areas of refuge from smoke. As a result, the Fillingham Report did not rank the Smoke Control Measures in terms of their effectiveness in providing smoke control only.

Perhaps the most reliable indicator that we have of the cost effectiveness of the various Smoke Control Measures is that the apartment and office industry, when given the choice of the method by which they will conform to the requirements for smoke control in new buildings, have chosen to use sprinklers.[39] It seems to me that when they make decisions regarding how they will use their limited financial resources in complying with certain code requirements, their decision is the result of following a process akin to a cost-effectiveness analysis.

If sprinklers are to be made mandatory for all highrise buildings, one would have to be convinced that they have an acceptable reliability record. The terms "reliability of sprinklers" and "effectiveness of sprinklers" were used interchangeably throughout the Inquiry. These concepts were most often described as a percentage, that is, sprinkler performance was satisfactory in a certain percentage of the reported cases.

The ability to arrive at a reliable percentage is, however, made difficult by the lack of sufficient statistical information. The difficulty was described in an article published in the May 1980 Edition of the Fire Journal as follows:

> "Today, only a scant number of organizations keep any kind of usable statistical data on sprinkler performance. The information recorded is usually not complete, nor is it sufficient in detail or breakdown to allow an explicitly comprehensive analysis. The very few organizations that do provide such records do not have a common or uniform system of data collection. This makes the task of conducting comparative studies that would provide objective and meaningful evaluations very difficult. . ."[40]

My comments and recommendations regarding better statistics for sprinklers are found in Chapter 1.

Notwithstanding these difficulties, the statistics regarding the effectiveness of sprinklers as contained in the Fillingham Report (Exhibit 119) and as reported by NFPA and others, indicates that the effectiveness of sprinklers expressed as a percentage is consistently over 95 percent. Notwithstanding my inability to evaluate a sprinkler installation on a cost effective basis, the need for such protection from a fire safety point of view is clear.

Installation Standards for Sprinklers:

The OBC, Sentence 6.7.4.1(1) states as follows:

> Where the installation of sprinklers is required in the building code, they shall be designed, constructed, installed and tested in conformance with NFPA 13-1973, 'Installation of Sprinkler Systems', as revised to 1, May 1975.

The urgency of updating the reference to this type of standard to the current edition of the standard has already been commented on in Chapter 2.[41]

Aside from the reference to an outdated edition of this standard in the OBC, the main issue which arose regarding the technical requirements for sprinkler installation involved electrical supervision of control valves, and water-flow valves.

The OFC requires that the fire department be notified when any alterations, additions or repairs are to be made to a sprinkler system which involves the interruption of sprinkler protection due to the shutdown of control or flow valves (OFC 6.5.2). This Subsection and OFC Article 1.1.1.2 emphasize the importance of the fire department being notified of sprinkler shutdowns and of proper supervision of control and water flow valves for sprinkler systems.

Recommendation:

7.6 The Ontario Building Code should be amended to provide that control valves for sprinkler systems should be equipped with a supervisory signal system with a direct connection to the fire department.

The electrical supervision of control valves is presently dealt with in OBC 6.7.5 as follows:

> Where standpipe and sprinkler systems control valves are required to be electrically supervised as indicated in Subsection

> 6.7.3 and 6.7.4, such supervision shall be accomplished by electrically connecting, on a separate circuit, each valve supervisory device attached to a valve, directly to an annunciator located adjacent to but in no way electrically connected to the fire alarm annunciator or annunciators. (6.7.5.1)

The annunciator referred to in Article 6.7.5.1 is part of the annunciator panel which is located at the central alarm and control facility required under 3.2.6.8(1)(c).

The electrical supervision contemplated by Subection 6.7.5 is a type which will notify supervisory staff within the building. It does not require the fire department to be automatically notified of a failure in the system or a shut-down of the sprinkler system by way of a direct connection to the fire department or connection to an independent central station.

The electrical supervision required by Subsection 6.7.5 of the OBC must continue. This recommendation imposes the additional requirement of a direct connection to the fire department.

Subsection 6.7.4 of the OBC provides that a sprinkler system must be installed in accordance with NFPA 13. Section 3 — 14.2.3 of that Standard deals with supervision of control valves. It states:

> "Valves controlling sprinkler systems, except underground gate valves with roadway boxes, shall be supervised open by one of the following methods:
>
> a) Central station, proprietary or remote station alarm service,
> b) Local alarm service which will cause the sounding of an audible signal at a constantly attended point,
> c) Locking valves open,
> d) Sealing of valves and approved weekly record inspection when valves are located within fenced enclosures under the control of the owner."

The Inquiry heard evidence regarding vandalism of control valves not being detected because of an inadequate level of maintenance. In my view, this recommendation should result in fewer closed or damaged control valves going undetected. I do not believe that options "c" or "d" alone are adequate, although I recognize that the OBC would accept these alternatives.

This recommendation should also ensure that the fire department is notified of the shutdown of control valves as required by the Ontario Fire Code.

Although the effectiveness of sprinklers is in the 90th percentile, the statistics as to sprinkler failure indicate that water shut off is a prime cause of failure.[42]

Mr. Miller, one of the witnesses called by CASA stated:

> "If there is one way to strengthen sprinkler systems, it is to make the electrical supervision mandatory."[43]

He testified that in Australia the supervision is done by way of a direct connection to the fire department. This is also the evidence as contained in the Fillingham Report.

Recent Developments Relating to Sprinklers:

There have been three relatively recent developments in relation to sprinklers:

1. The development of an NFPA Standard for sprinkler systems in one and two-family dwellings. (NFPA 13D — Exhibit 254)
2. The development of a "quick response" sprinkler head for residential use.
3. The development of polybutelyne pipe for use in residential occupancies with automatic sprinkler systems.

NFPA 13D deals with the design and installation of automatic sprinkler systems for one and two-family dwellings and mobile homes. The purpose of this standard is stated to be, "to provide a sprinkler system that will aid in the detection and control of residential fires and thus provide improved protection against injury, life loss and property damage." I will not deal with NFPA 13D in any detail as it is not referenced in any Ontario legislation, nor have I recommended mandatory sprinklering for residential areas in highrise apartment buildings.

If sprinklers are installed in compartmented areas of highrise buildings such as apartments and hotel suites, it may not be necessary to employ NFPA 13 as a standard for installation. Consideration might be given to adopting NFPA 13D or the development of a less onerous standard for sprinklers in such areas. This is a matter which I assume will be considered by the Division of Building Research in their study regarding mandatory sprinklering of buildings in general.

The recently developed "quick response" sprinkler head is one which operates at the same temperature rating as those heads used pursuant to NFPA 13, but it reacts up to five times faster than a standard head. It is meant for residential use in wet pipe systems when they have been designed and installed in accordance with NFPA 13D (1980). The toxic gases which are created by fire will be limited at an earlier stage of the fire with the use of a fast-acting head. This device is advantageous where the prime purpose of the sprinkler system is life safety in residences rather than the usual purpose of the protection of property.

Polybutelyne pipe is a plastic pipe which has been recently developed in the United States for use in residential occupancies with automatic sprinkler systems. In Florida, its use is being allowed on an experimental basis. No evidence was received that this pipe has been approved for use in any other North American jurisdiction.

The evidence relating to plastic pipe was, however, conflicting. The Cast Iron Soil Pipe Division of the Canadian Foundry Association voiced concern that plastic pipe, when exposed to fire could produce "poisonous chemicals, excessive smoke, and great heat."[44] The promoters of polybutelyne pipe suggest that the two main positive features of the pipe are that it will not burn or give off toxic gases and fumes if exposed to fire, and that the cost of installing this type of pipe when compared to the cost of installing metal sprinkler pipe is substantially lower. The difference in price was described as being significant, and therefore the prospects of reduced cost of sprinkler installation for both new construction and on a retrofit basis may be on the horizon.

The Inquiry received a report from Mr. A. Chow of the OFM regarding test burns in Fort Lauderdale, Florida which were conducted in September, 1982. The tests were performed to assess the performance of both polybutelyne pipe and the quick response sprinkler head. Further evidence was received from The Canadian Automatic Sprinkler Association relating to these tests.[45]

The developments relating to this pipe and the quick response head should be monitored. If the positive features referred to are substantiated, a reassessment of sprinklers will be required.

[1] Exhibit 81 is the Organizational Chart of NRC.

[2] Exhibit 82 is the Organizational Chart of NRC (Division of Building Research); Exhibits 76 to 78 are background.

[3] NRC, The Fire Research Section of the Division of Building Research, n.d. (pamphlet).

[4] NRC, Fire Research Field Station, n.d. (pamphlet).

[5] Exhibit 83.

[6] National Building Code, 1970, p. 99.

[7] Transcript, Volume 14, p. 88.

[8] National Building Code 1980, p. 395.

[9] Transcript, Volume 40, p. 64.

[10] Recommendation 3.4.

[11] Transcript, Volume 14, p. 19.

[12] See the evidence of Christopher Fillingham, Transcript, Volume 26, p. 61, and Graham Adams, Transcript, Volume 21, p. 119.

[13] Transcript, Volume 52, pp. 31 to 32.

[14] Transcript, Volume 40, pp. 90 to 92.

[15] OBC Sentence 3.2.6.2(8).

[16] See discussion of fire stopping in Chapter 13 under "Trades".

[17] Exhibit 279.

[18] Dunlop, Farrow and Aitken, *A Study of Additional Requirements for High Commercial Buildings*, 1982, pp. 14 to 15.

[19] *Ibid*. Figure 3, p. 23.

[20] *Ibid*. Figure 5, p. 30.

[21] J.H. McGuire and G.T. Tamura, *The National Building Code Smoke Control Measures — An Overview*, Engineering Digest, October, 1979, p. 38.

[22] *Ibid*. p. 35.

[23] *Ibid*. p. 36.

[24] Exhibit 133.

[25] Sentence 3.2.6.2(8), Proposed amendments to OBC.

[26] The Inquiry was advised by Roy Philippe that, in Toronto, this problem also arose in buildings with spandrels.

[27] Dunlop, Farrow and Aitken, *A Study of Additional Requirements for High Commercial Buildings*, 1982, pp. 5 to 6.

[28] Exhibit 235, pp. 19 to 20.

[29] Exhibit 235, Appendix C.

[30] Dunlop, Farrow and Aitken, *A Study of Additional Requirements for High Commercial Buildings*, 1982, p. 85.

[31] Vinto Engineering Limited, *Summary Report Cost Comparison Study of Alternate Smoke Control Measures for Highrise Buildings*, Prepared for Fire Prevention Branch, Department of Labour, Government of Alberta, November, 1982.

[32] Recommendation 7.5.

[33] Dunlop, Farrow and Aitken, *A Study of Additional Requirements for High Commercial Buildings*, 1982, pp. 104-105. Note that "Subsidiary Occupancies" is not a defined term in the OBC.

[34] Sask. Reg. 63/79 (Exhibit 263).

[35] Regulation passed pursuant to the *Fire Prevention Act*, R.S.N.S. 1967, c. 107 (Exhibit 262).

[36] Vinto Engineering Limited, *Summary Report Cost Comparison Study of Alternate Smoke Control Measures for Highrise Buildings*, 1982.

[37] i.e. It may be more expensive to maintain a pressurization system than a Sprinkler system on a life-cycle basis; evidence of Christopher Fillingham, Transcript, Volume 25, pp. 111 to 112.

[38] The fire at the First Canadian Place on June 10, 1983 is described in Chapter 5.

[39] Exhibits 145 and 217. Jenson — Survey of Sprinkler Systems in Highrise Buildings in Toronto.

[40] Exhibit 148, p. 65.

[41] See Chapter 2 under the heading "Ontario Building Code".

[42] Dunlop, Farrow and Aitken, *A Study of the Additional Requirements for High Commercial Buildings*, 1982, p. 98.

[43] Transcript, Volume 56, p. 39.

[44] Brief 22, p. 2.

[45] Exhibits 188 and 188A.

Chapter 8

Building Systems: Fire Alarm Systems, Elevators, and Electrical Conductors

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The building systems discussed in this Chapter are directed primarily to detection (fire alarm systems) and elevators. I also discuss electrical conductors used for various fire safety equipment.

FIRE ALARM SYSTEMS

Fire alarm systems, the means by which occupants of a building are notified that there is a fire within the building, are a fundamental and essential part of the life safety system within a building. No one suggested that a highrise building did not need a fire alarm system. In Chapter 10, I have recommended that all existing highrise buildings must have an acceptable fire alarm system.

Although there are a number of different types of automatic fire alarm systems described in the OBC (Table 3.2.4A), I believe that for the purpose of understanding this report, a brief explanation of the terms "general evacuation alarm" and "two-stage alarm" will be sufficient.

A "general evacuation alarm" is one which sounds throughout an entire building upon being activated, regardless of the location of or the type of initiating device. Such an alarm has only one "temporal pattern" or sound, and the sounding of such an alarm is meant to be an instruction for all occupants to evacuate the building.

A "two-stage alarm", like a general evacuation alarm, sounds throughout an entire building upon being activated, regardless of the location of or the type of initiating device. The difference between a general evacuation alarm and a two-stage alarm is that with a two-stage alarm, there are two "temporal patterns." The first is an alert alarm, which warns persons that a fire emergency exists. When such an alert alarm is heard, occupants stand by for further advice or instruction. If the second-stage alarm operates, a general evacuation alarm using a different temporal pattern will sound. This alarm constitutes an instruction for the occupants to evacuate the building. In most cases, the general alarm must be activated by supervisory staff.

In addition to describing different types of fire alarm systems, the OBC contains detailed provisions with regard to the following components of a fire alarm system:

1. Smoke detectors in various locations connected to the alarm system.
2. Electrically supervised annunciator panels inside the street entrance floor of every highrise which indicate the location of the device which activated the fire alarm system.
3. Direct connection of the fire alarm system to the fire department by one of a number of designated methods. The intent of such connections is to cause

the existence of an alarm within a building to be brought immediately to the attention of the fire department.

4. Emergency electrical power supply for the fire alarm system.

The above list is not a definitive statement of all the various facets of fire alarm systems dealt with in the Ontario Building Code. I do not propose to outline all of the OBC provisions dealing with fire alarm systems or to write an exhaustive description of fire alarm systems within highrise buildings. I believe this report will be most useful if I make specific recommendations arising from concerns voiced during the Inquiry and provide the reasons therefore.

Recommendation:

8.1 In highrise buildings, all existing fire alarm systems that have not been verified under CAN 4-S537-82, its predecessor or an acceptable manufacturer's installation test, should be subject to a one time test pursuant to CAN 4-S536-82 Parts 1, 2 and 3.

Three standards dealing with fire alarm systems were the subject of considerable evidence. Those standards were:

CAN 4-S524-M82	— Standard for the Installation of Fire Alarm Systems
CAN 4-S537-82	— Standard for the Verification of Fire Alarm Systems
CAN 4-S536-82	— Standard for the Testing, Inspection and Maintenance of Existing Fire Alarm Systems (Exhibits 57A, B & C)

Where a building does contain a fire alarm system, the OFC provides that it be maintained in accordance with Part 4: "Periodic testing of fire alarm system" of ULC S-536-1979, "Standard for the Testing, Inspection and Maintenance of Existing Fire Alarm Systems", the predecessor of CAN 4-S536-82.

Based on the evidence, I have concluded that even if an alarm system is maintained as described in Part 4 of ULC 536, there is no assurance that the fire alarm system will function as intended. John Hess, a member of the ULC 536 Committee, testified that the tests in Part 4 assume a system which complies with Parts 1, 2 and 3 of that Standard. The implementation of this recommendation would require the amendment of Article 6.3.2.1 of the OFC in order to reference all parts of ULC 536 (now Can 4-S536-82).

This Recommendation was also supported by the City of Toronto.

Recommendation:

8.2 The appropriate code committee should consider amending the Ontario Building Code to provide that where a two-stage alarm is required, a general evacuation signal must sound in the initiated fire zone and a general alert throughout the remainder of the building.

At the present time, the OBC requires the installation of two-stage fire alarm systems in certain highrise buildings (OBC 3.2.4.2(4)(5)). For such an alarm system, the OBC provides that upon the operation of any alarm-initiating device, an alert-alarm sounding device only need be sounded. There is no requirement that there be a general evacuation alarm on the floor where the alarm was initiated or on the floor either immediately above or below that floor. In comparison, the HFSA requires a general evacuation alarm on the floor where the alarm is initiated.

Theoretically, the floor on which the alarm is initiated is the fire floor. If the proper action to take in a fire situation is to evacuate if possible, theory would suggest that a general evacuation alarm should sound at least on the floor where the initiating device was activated, and probably on the floors immediately above and below as well.

Recommendation:

> ***8.3 Once activated, a fire alarm should not be turned off except by the Fire Department, or with their authorization.***

Case studies have indicated that the premature silencing of fire alarms can contribute to the loss of life. In addition, the silencing of an alarm is often considered as an indication that the fire emergency is over. This recommendation is meant to ensure that alarms will not be silenced unless it is appropriate to do so, thereby increasing the reliability of fire alarm systems.

Recommendation:

> ***8.4 The appropriate code committee should consider amending the Ontario Building Code to require that the activation of the trouble signal on the fire alarm control panel will cause a signal at or near the central alarm and control facility.***

At the present time, if there is a problem with the fire alarm system, a trouble signal is initiated on the fire alarm control panel. This control panel is not usually part of the annunciator panel, but is often located in a mechanical room or other relatively remote or isolated area which is not frequented by building staff. If the trouble signal occurs in that area, the signal and the fault in the alarm system might go undetected for some time. It is my view that the inclusion of such a signal in the central alarm and control facility either as an addition to or an alternate location for the present situation would result in an increased level of life safety.

Recommendation:

> ***8.5 The meaning of the various patterns of sounds (temporal patterns) made by fire alarm systems should be uniform, regardless of whether the actual sound differs.***

In their Brief, the Canadian Fire Alarm Association said:

> "We urge the acceptance of the "temporal" pattern (as recommended by the ISO — International Standard Organization) as the universal emergency signal. This signal; a repeated pattern of three on/off rings or tones, can be generated by most existing devices by changes in control equipment only. This drastically reduces the ultimate cost of putting a uniform emergency signal in place. If all signalling appliances were made to beat out the same pattern, the problems of public confusion, hesitancy and lack of response to emergency situations could be greatly alleviated."

This recommendation is made to decrease confusion over whether the sounding of a fire alarm means the occupants should stand by or evacuate.

False Alarms:

Recommendation:

8.6 The Ontario Building Code should be amended to permit the Chief Building Official to approve reliable alternatives to manual pull stations as a means of activating fire alarm systems in those buildings that may experience high incidence of false alarms.

Recommendation:

8.7 The Ontario Fire Code should be amended to permit the Chief Fire Official, in conjunction with the Chief Building Official, to order the relocation or removal of manual pull stations where, in their discretion, such action is necessary to deal adequately with a high incidence of false alarms in a building.

The greatest problem related to fire alarm systems is the high incidence of malicious false alarms. False alarms give rise to concern because the firefighting equipment and personnel that respond to such alarms are not available for legitimate calls. In addition, occupants of buildings where the false alarm rate is high tend to ignore the alarm more frequently than those occupants in buildings where there are fewer false alarms.

Below is a list of important facts related to the false alarm problem, which clearly demonstrate the magnitude of the problem:

1. The number of false alarms varies from one area of a municipality to another. It is common to find one or two buildings being the source of a significant majority of the false alarms any one fire department receives. For example, in three sub-wards in the City of Toronto having approximately the same number of highrise apartment buildings, the number of false alarms for each of those sub-wards ranged from 169 to 1160. The particular sub-ward with 1160 false alarms constituted approximately *30% of all of the fire alarms* received in the City of Toronto (Exhibit 206).
2. The majority of false alarms in apartment buildings originate from the lobby areas. For example, in OHC buildings, 60-70% of the false alarms originated in this area (Exhibit 207).
3. Most false alarms are initiated in apartment buildings.
4. In the City of North York the cost of a fire department response to a false alarm is approximately $2,800.00.

Based on my understanding of the evidence, the recommendations I have made are supported by the fire chiefs in the Municipality of Metropolitan Toronto (Brief 53), the Ontario Association of Fire Chiefs, the City of Toronto (Brief 17) and representatives of the Office of the Fire Marshal (Exhibit 207).

The proposed methods of approaching the problem of false alarms varied from moving pull stations further from exit stairwells to removing pull stations altogether. Mr. Landmesser, the President of the Canadian Fire Alarm Association, testified that there are viable alternatives to the manual pull stations as initiating devices for fire alarm systems. The view that manual pull stations are not essential in highrise buildings is reflected in NFPA 101— Life Safety Code. That Code does not mandate pull stations in any type of highrise occupancy.

Specific criteria must be established to identify the situations in which alternatives may be substituted for code requirements and what those alternatives can be. The necessary technical committee should be given the task of recommending alternatives to the present code requirements in such situations.

Recommendation:

8.8 When a conviction for causing a false alarm contrary to the* Criminal Code *is entered, the court should impose substantial penalties including restitution orders for the cost of the fire department's unnecessary response.

The reasons for grave concern about malicious false alarms have been reviewed above. It should be the responsibility of Crown Counsel in a sentencing situation to draw to the attention of the presiding judge the potential danger that is created by continuous false alarms. Crown Counsel should also advise the court, upon information received from the fire department, of the total cost of the attendance of the fire department in response to a malicious false alarm.

My review of the evidence leads me to conclude that when the sentencing stage is reached, the courts generally are not receiving sufficient information as to the seriousness of malicious false alarms or the cost to the community of responding to the false alarm. In addition, I believe that it is appropriate that the sentencing judge consider, as part of the sentencing process, the possibility of accidents because of fire vehicles speeding to the scene of the "false fire", and the possible dangers posed to the residents of the building in which a malicious false alarm occurs. It is my view that the time has come for small fines to be replaced by substantial penalties together with restitution orders for the cost of responding to malicious false alarms.

Because it is common to find that a large percentage of false alarms in any one area come from a few buildings, I believe that if publicity were given as to the penalties imposed for malicious false alarms, the communities in which they occur frequently would soon be aware of the sanctions that could be imposed.

ELEVATORS

In Ontario, the installation and maintenance of elevators is regulated by the Ontario Building Code, the Ontario Fire Code, and the *Elevating Devices Act*, 1980 which is administered by the Ontario Ministry of Consumer and Commercial Relations (Technical Standards Division).

Ontario Building Code Provisions:

The OBC requires all highrise buildings to have at least one elevator provided for use by firefighters (3.2.6.4(1)). Such elevators will hereinafter be referred to as "firefighters' elevators". The OBC contains a number of mandatory requirements for firefighters' elevators (3.2.6.4) including the requirement to be operable under conditions of exposure to fire from the outside of the elevator shaft for a period of one hour, and protection of electrical conductors serving such elevators.

Although new highrise buildings require at least one firefighters' elevator, they invariably have more than one elevator. The OBC contains certain mandatory provisions regarding these "optional" elevators. For instance, some elevator doors are equipped with photo-electric devices which control their opening and closing. These devices may be affected by smoke. It is undesirable to have an elevator held open on a floor filled with smoke or hot gases for two reasons. First, people may be in the elevator and thereby be exposed to the heat and smoke; second, the open doors allow any smoke or gases on the floor in question to enter the elevator shaft and migrate throughout the shaft and to other parts of the building. The OBC requires mechanisms to ensure that those elevator doors which may be held open because of smoke or hot gases, close automatically after being held open for ten seconds (3.2.6.3(1)).

The OBC also requires a key-operated switch which will recall all elevators to a designated floor. This key switch must be in a conspicuous location on the outside of the elevator shaft at or near the central alarm and control facility which is usually in the lobby area.

In addition, each elevator must be equipped with a key-operated switch in the elevator car which will allow the elevator car to be operated independently of other elevators. When the switch is being used, the elevator car will not be affected by any call buttons, and the firefighters will have complete control over the opening and closing of the car door.

Elevating Devices Act Provisions:

The Canadian Standards Association publishes a safety code for elevators referred to as CSA B44-1975. I will refer to this Code as the Elevator Safety Code. The purpose of the Elevator Safety Code is stated within the preface to the Code as follows:

> "The code was originally prepared to meet a desire for uniform legislation throughout the various Provinces and to replace the legislation previously existing in Canada which had proved inadequate in view of the then prevailing elevator practices. Its primary purpose is to provide reasonable safety for those persons who come in contact with elevators, dumbwaiters, escalators and moving walks by establishing minimum standards for design, installation, and maintenance and for adoption by provincial authority throughout Canada. It is also intended as a standard reference for the use of architects, consulting engineers, elevator manufacturers, and owners."

The *Elevating Devices Act* has adopted the Elevator Safety Code as part of the Provincial law.[1] The *Elevating Devices Act* came into force on May 1, 1981. In very broad and general terms, the major difference between the new Act and its predecessor is the inclusion in the new Act of a requirement that all elevator contractors be registered with the Province and "that no work shall be undertaken on an elevating device by a contractor unless it is performed by a mechanic or under the supervision of a mechanic." A "mechanic" is defined in the *Elevating Devices Act* as:

> a person who has a minimum of four years work experience directly related to the work assigned to him and who has full knowledge of this Act [Elevating Devices Act] and the Regulation and of the Codes applicable to the elevating device upon which he is assigned to work.

There is no requirement for certification of such mechanics.

Although a number of witnesses made reference to elevators in highrise buildings, the technical evidence relating to the *Elevating Devices Act* and the Elevator Safety Code was given primarily by Mr. T.G. Smith, Director of the Elevating Devices Branch, and Mr. Ted Tuff, General Manager of Otis Elevator Company Ltd. and Chairman of the B44 Code Committee for many years.

Ontario Fire Code Provisions:

The OFC contains provisions for the testing of elevator door-opening devices, and the key-operated switches located outside the elevator shaft and in each elevator car. It also contains maintenance provisions.[2]

Some of the minimum standards for design, installation and maintenance contained within the Elevator Safety Code overlap some of the regulatory provisions contained in the OBC and Ontario Fire Code. In some cases, this overlapping results in conflicts between the *Elevating Devices Act* and the Ontario Building Code. Some of the following recommendations are made in order to resolve these conflicts.

Recommendation:

> ***8.9 The requirements for emergency power for elevators in the Ontario Building Code and*** **Elevating Devices Act** ***should be consistent; or, in the alternative, the legislation should clearly identify which requirement prevails.***

The OBC requires the installation of a firefighters' elevator in hotels and apartment buildings over 6 storeys in height, and in hospitals over three storeys. It does not, however, require emergency power to be provided for these elevators unless the building is over 120 feet in height.[3]

The Elevator Safety Code, requires emergency power to be provided for every elevator designated as a firefighters' elevator regardless of the height of the building.[4]

The reasons for this discrepancy were not apparent. One factor which may have been considered is the cost effectiveness of emergency power in a building under 12 storeys.

Recommendation:

> ***8.10 The conflict between the*** **Elevating Devices Act** ***and the Ontario Building Code regarding sprinklers in elevator machine rooms should be resolved.***

The OBC provides that where buildings are sprinklered, NFPA 13-1975 is the installation standard which applies. That Standard requires all areas of the building to be sprinklered, and "all areas" has been interpreted as including elevator machine rooms.

The Elevator Safety Code prohibits sprinklers in elevator machine rooms. Clause 2.3.2.3 of that Code states:

> "Fire extinguishing equipment using water as the extinguishing medium shall not be installed in machine rooms and secondary levels."

At the present time, this conflict has been resolved by the Director of the Elevating Devices Branch, by issuing an order pursuant to Section 31(5) of the *Elevating Devices Act* providing that Clause 2.3.2.3 of the Elevator Code does not apply in Ontario. As a result, sprinklers can be installed in elevator machine rooms in Ontario.

The concern that some witnesses had regarding sprinklers in elevator machine rooms is based on the possibility of water from sprinklers causing short circuits in the electrical equipment controlling the elevator, and thereby causing various malfunctions of the elevator.

In highrise buildings, most elevator machine rooms are located at the top of the building. In most cases, where the fire has become hot enought to set off sprinklers within the elevator machine room, and where the building has an elevator recall system, the elevators will have been recalled from general service. As a result, the occupants of those buildings would not be at risk due to short circuits caused by water on the electrical control equipment. This, however, does not provide an adequate answer to those concerned with the safety of firefighters and other rescue personnel who are required to use the elevator in emergency situations.

In September of 1982, the B44 Committee proposed that a method of resolving this conflict would be to have a system which included a pre-action sprinkler-type system with high temperature sprinkler heads in the elevator machine room. Other requirements were also suggested as part of the entire system (Exhibit 115).

The Inquiry was advised that this proposal of the B44 Committee will be referred to the Division of Building Research as part of their consideration for mandatory sprinklers for buildings generally (Exhibit 302). It is my view that the ultimate resolution of this conflict must be one which provides the greatest degree of safety to the firefighters and other rescue personnel who are the persons most likely to be on the elevator in an emergency situation. It is also my view that the recommendations of the B44 Committee are a reasonable compromise which provides that degree of safety while maintaining sprinklers in machine rooms.

Recommendation:

8.11 The Ontario Building Code should require the installation of smoke/heat sensors at the recall level in order to route elevators to an alternate floor in case of fire at the recall level.

The OBC specifies that the elevator recall system must return all elevators to the street floor or transfer lobby. This is undesirable if the fire is located at that level. Provisions for re-routing the elevator to an alternate floor when the fire is at the recall level are therefore required.

The concern over a fire at the recall level was discussed at a meeting between the B44 Code Committee and the ACNBC in February of 1983. My recommendation is a reproduction of the agreement reached at that meeting (Exhibit 302).

Recommendation:

8.12 Any existing vent in a highrise building or any vent to be installed in a new highrise building which has as its purpose the venting of any elevator shaft at the roof level should be closed and should not open automatically upon the activation of a fire alarm. All of these elevator vents must have the capability to be opened manually by the fire department and the additional capability to be opened by use of a remote device located at ground level, but only under the control and direction of the fire department.

Recommendation:

8.13 The benefits, limitations or the usefulness of elevator shaft vents as an aid to smoke removal should be assessed.

Mr. Rashmi Nathwani, Deputy Chief Building Official for the City of Toronto, expressed concern about the practice of building elevator shafts with an openable vent at the top. Due to stack action in high buildings, a shaft with an open top will behave like a chimney. This phenomenon gives rise to two concerns: The rising smoke could have a detrimental effect on persons who may be in the shaft; and if the opening is not sufficient to vent all of the smoke out the top, smoke can migrate out of the shaft and onto the floors.

The issue of vents at the top of elevator hoistways was also discussed by Mr. George Tamura. He gave evidence that if elevators are intended for evacuation or for firefighters, the vents at the top of the elevator shafts should be minimized as much as possible. If the shaft is to be used for smoke evacuation, the shaft must be top-vented but the vent must be enlarged. Although the opening of a top vent in an elevator shaft can minimize the amount of smoke moving onto the floors, this is less practical in higher buildings because the required vent size would be more than 50% of the area of the top of the shaft. The vent should not open automatically, but rather the firefighters should be able to open it manually in proper circumstances.

The Elevator Safety Code permits shaft vents only when required by, and in conformance with, the applicable building code (Elevator Safety Code 2.2.4). This Clause has a long history and has changed from originally *requiring* a vent from 1938-1966 to the present wording, which does not allow elevator vents unless they are required by the applicable building code.

The "applicable building code" (OBC) refers to vents at the top of elevator shafts when discussing the smoke-venting requirements for high buildings (3.2.6.6(5)) and elevators generally (6.5.2.2).

If a highrise building is sprinklered, an elevator shaft, other than a shaft and associated machine room containing a firefighters' elevator, may be used as the means of complying with the venting requirements for high buildings (3.2.6.5). I will not deal with the other features which are required in order for the elevator shaft to be acceptable as a means of venting as it appears from the evidence that use of an elevator shaft for this purpose is rare.

The effect of Article 6.5.2.2 of the OBC is that, in Ontario, except where a building has been designed to control smoke movement, every elevator shaft in a new building must have a vent at the top of the shaft which is either open permanently, or, where not permanently open, must be capable of being opened manually from the outside and open automatically by means of a fusable link.

No one could explain why the requirement for a top vent came into being in the first place. The proposed amendments to the OBC (Exhibit 130) delete Article 6.5.2.2 and no general provisions relating to elevators have been proposed for the sub-section that has been reserved for elevators (3.5.5). If the OBC is amended as proposed in Exhibit 130, it will not require a vent at the top of the elevator hoistway, except where an elevator shaft is used as a means of complying with the venting requirements of 3.2.6.5. The result will be that Clause 2.2.4 of the Elevator Safety Code will prohibit top vents in elevator shafts in new buildings.

Recommendation 8.13 would have the effect of requiring vents in existing buildings to be closed.

Recommendation:

8.14 The Ontario Building Code and the Elevating Devices Act should be made consistent regarding the requirement for elevator recall in an emergency situation.

The OBC provides that the elevator recall system must cause the immediate return of *all* cars to the street floor or transfer lobby (3.2.6.3(2)). The *Elevating Devices Act* contemplates there being elevator cars which are operated by a designated attendant (e.g., hospital service, independent service, attendant operation), and such elevators, if in service, will not be recalled immediately as required by the Ontario Building Code. The Elevator Safety Code presently contemplates an audible signal being sounded to alert the attendants in such elevators to close the doors. Only after those doors have been closed by the attendant will the recall system cause the return of the elevator car to the designated level.

The Elevator Safety Code Committee recommended that a distinction be drawn between elevators on "independent service" and those on "designated service" when deciding whether elevators which are in service should be capable of being recalled to a designated level.

The Elevator Safety Code Committee defined "designated service" as an elevator which is being operated by an attendant such as a hospital service elevator. In their view, it is not necessary that such elevators be capable of being recalled.

An elevator is on "independent service" when it is being operated by someone other than a designated attendant; for example, when an elevator is being used by someone to move furniture. When on "independent service", an elevator can be held on any floor by use of the key within the elevator and in most cases cannot be recalled to the recall level for use in an emergency other than by means of the audible signal being sounded as referred to above. This inability to recall elevators on independent service exists in buildings constructed in accordance with the OBC as well as in pre-1975 buildings.

In some apartment buildings there is no firefighters' elevator, and the only elevator capable of being controlled from the inside independently of the elevator call buttons, is the service elevator which can be put on independent service. It is for this reason that the Elevator Safety Code Committee has recommended that elevators on "independent service" should be capable of being recalled.

It is my view that the recommendation of the Elevator Safety Code Committee has merit. The Commission was advised that the cost of providing a switch to recall an elevator which is on independent service was estimated at $225.00 per elevator, labour and material included.

Recommendation:

8.15 All existing highrise buildings which do not have a firefighters' elevator as contemplated by the Ontario Building Code, should be required to have at least one elevator car equipped with a key-operated switch inside the car which will allow the firefighter to use that elevator independently of other elevators and to go only to a desired floor, and a key-operated switch at ground level to recall that elevator.

This Recommendation will result in all highrise buildings having an elevator available to firefighters which has the most important elements of a firefighters' elevator contemplated by the Ontario Building Code.

The ability of a firefighter to deal with a fire in a highrise building without an elevator needs little discussion. The fire at The Toronto-Dominion Centre, Toronto, Ontario, described in Chapter 5, illustrated the detrimental effect that lack of an elevator for firefighter use can have on the ultimate outcome of a fire.

The cost of complying with this recommendation in a building with a bank of three elevators would be approximately $3,750.00 per elevator, according to Mr. Tuff of Otis Elevator Company Ltd.

This retrofit item was one of several suggestions made by Commission Counsel which was agreed to by the apartment and office industry.

Recommendation:

8.16 The Ontario Building Code should be amended to require automatic recall of elevators in addition to the present requirement for manual recall.

At the present time, the OBC and the Elevator Safety Code require manual recall only. Automatic recall may be added as an additional feature of the recall system at the option of the building owner.

The advantage of having an automatic recall system is that there is no delay in disconnecting the elevator call buttons once the fire alarm is sounded. The Inquiry was advised by Mr. Tuff that automatic recall of elevators is mandatory in the United States.

In a building where there is a significant number of false alarms, automatic recall of elevators could create substantial inconvenience. I am of the opinion that the benefit of automatic recall will outweigh this inconvenience. I note that no alarm should be treated as false, and therefore even with manual recall, all elevators should be recalled immediately.

Recommendation:

8.17 Further study should be undertaken to assess the feasibility of using elevators as a means of evacuation during a fire emergency.

There are three reasons for this recommendation:

1. The difficulty of evacuating handicapped occupants by means other than elevators.
2. The potential difficulties due to stairwells being used by occupants for evacuation, and concurrently by firefighters as staging areas for firefighting purposes.
3. The possibility of taking advantage of everyday human behaviour by introducing an evacuation process (the elevator) which is the normal means of egress.

Jake Pauls, an expert in evacuation methods for high buildings, testified that in the mid-1970's some research was done on the use of elevators as a means of evacuation, but very little has been done since that time. It was his view that the work done in the mid-1970's did not address a number of major problems and that a systematic investigation of elevator use for large-scale evacuation should be undertaken.

Mr. Tuff gave evidence that the use of elevators for evacuation purposes "may not be inconceivable" and he gave some suggestions as to how this might be accomplished. For example, evidence was received that with certain limitations, battery-operated elevators are being developed and marketed in other jurisdictions. If elevators powered by batteries could be used, the concern about loss of power during an emergency might be adequately met.

The major problems which would have to be addressed would not be limited to technical matters. Problems of crowd management and other elements of human behaviour have to be studied in order to have efficient use of elevators. For example, the possible competition by occupants for use of the elevator in an emergency situation would have to be controlled in some way if the evacuation procedures assigned certain persons to use the elevator on a priority basis, for instance, handicapped first.[5]

Recommendation:

8.18 In a building which is required to have emergency power for the elevators, the initial licence for the operation of an elevator should not be granted until the Director of the Elevating Devices Branch receives satisfactory proof that the emergency power system has been tested and found in compliance with CSA 282-1977, "Emergency Power Supply for Buildings".

I understand that the initial licence to operate an elevator can be issued even though there is no emergency power in the building or there has been no test of an emergency power system in accordance with CSA 282-1977. Apparently, the Director of the Elevating Devices Branch will issue the initial licence, but requests the engineer or the contractor who designed or installed the elevator system to provide a subsequent letter indicating that tests have been done which ensure that the emergency power system will, in fact, operate the elevator.

It was also my impression that the test performed by the engineer or the contractor and accepted by the Director of the Elevating Devices Branch was merely a test where the elevator alone was operating. Meeting the test described in CSA 282-1977 is not being required.

If I am correct, it is my view that the tests being accepted by the Elevating Devices Branch are insufficient. A test of an elevator on emergency power, where the elevator is the only equipment drawing emergency power, is no assurance that in a fire situation the elevator will operate if the fire pump, alarm system, voice communication, and fans used for venting are also drawing emergency power. The items other than the elevators which I have listed are items which, according to the OBC, must be supplied with emergency power.

I appreciate that this recommendation may require the implementation of a "temporary licencing" scheme for elevators.[6]

ELECTRICAL CONDUCTORS

The Electrical Safety Code, passed pursuant to the *Power Corporation Act*, regulates electrical installations in Ontario.[7] This Code is based on the Canadian Electrical Code which, like the NBC, is a model code which can be adopted in whole or in part by provincial governments. With some exceptions, Ontario has adopted Parts 1 and 2 of the Canadian Electrical Code which deal with safety standards for electrical installation and electrical equipment, respectively.

Enforcement of the installation requirements of the Electrical Safety Code is carried out by inspectors employed by Ontario Hydro. The purpose of the Electrical Safety Code is to ensure that there will be no undue shock or fire hazard as a result of the electrical installation. The fact that an electrical installation complies with the Electrical Safety Code is, however, no assurance that the electrical installation will perform its intended function.

The provisions of the Electrical Safety Code which have some relevance to this Inquiry involve emergency power supplies including requirements for automatic transfer switches (Section 6), busways (Sections 12), and wiring for fire alarm systems (Section 32).

The review of the Electrical Safety Code relating to these items revealed a number of conflicts with other legislation — primarily the Ontario Building Code. The following recommendations are made to resolve those conflicts.

Recommendation:

8.19 The Electrical Safety Code and the Ontario Building Code should be consistent with regard to the life safety devices which may be serviced by a power supply separate from the primary source of power in a highrise building.

Article 3.2.6.11 of the OBC requires an emergency power supply for fire alarm systems, voice communication systems, elevators in certain circumstances, fire pumps and ancillary electrically powered firefighting equipment, and for fans used for venting. The OBC indicates that this emergency supply of electricity in highrise buildings shall be provided by "a separate service not supplied from the same transformer as the primary source, or by a local emergency power supply."

Rule 6-100 of the Electrical Safety Code is more restrictive and allows a separate power supply for fire pumps and emergency lighting only. The Rule also allows a separate power supply in "buildings of a large area". If a highrise building is always considered a "building of a large area", there is no inconsistency.

In my view, the Electrical Safety Code is open to an interpretation which is inconsistent with the Ontario Building Code.

Recommendation:

8.20 The conflict between the Electrical Safety Code and the Ontario Building Code regarding when a separate electrical service can be supplied from the same transformer as the primary source of power to the building should be resolved.

Sentence 3.2.6.11(1) of the OBC does not allow an emergency power supply to be provided by a separate service which is supplied from the same transformer as the primary source of power.

Rule 6-100 of the Electrical Safety Code is less restrictive and does allow the emergency power supply for fire pumps to be supplied by a separate service even though it is supplied from the same transformer as the primary source.

I am uncertain whether this creates a problem in practice. I merely draw the conflict to the attention of the code writers for their consideration.

Recommendation:

8.21 The appropriate authorities should investigate the necessity and feasibility of amending the Electrical Safety Code to require that busways for new construction be modified so that water entering the busway system cannot cause power failure.

This recommendation arises primarily from the evidence relating to the fire at 88 Bloor Street East, Toronto, Ontario, which fire is described in Chapter 3. In that fire, water used for firefighting purposes on the 18th floor entered the busway, flowed down the busway to the 12th floor and onto the main circuit breakers — the result being a power failure. The emergency power system in that building failed to switch on automatically.

In commenting on a recommendation by the 88 Bloor Street Inquest jury, Mr. Yoneyama, Executive Director, Technical Standards Division, Ministry of Consumer and Commercial Relations stated that, according to Ontario Hydro:

> ". . .water-proofing switchgear and service boxes connected to conduit or bus ducts would be impractical and incompatible with virtually universal design and installation practices."[8]

Perhaps other alternatives can be considered.

Recommendation:

8.22 Ontario Hydro should assess the use of electrical conductors outside of conduit and determine whether amendments to the Electrical Safety Code are warranted.

The OBC contains certain requirements for the protection of electrical conductors. Sentence 3.2.6.4(7) requires electrical conductors for the operation of elevators that ensure operation for a period of one hour when subjected to temperature conditions described in the Code. Article 3.2.6.10 requires electrical conductors for emergency equipment to be protected against exposure to fire to ensure continued operation for a period of at least one hour. This protection is usually provided by installing the electrical conductors in service spaces which are fire resistant. Sentence 3.2.6.11(1) requires an emergency power supply for fire alarm and voice communication systems, firefighters elevators, water supply for firefighting and fans for venting to operate under full load for at least two hours.

The Electrical Safety Code requires the electrical conductors for certain equipment, such as fire alarm systems, to be encased in metal conduit (Rule 32-016). In Ontario, the Building Materials Evaluation Commission (BMEC) has the power to permit the use of innovative materials, techniques or building designs not contemplated by the Ontario Building Code. The BMEC has accepted the use of electrical cable in plenum outside of conduit if it meets the requirements of a U.S. test for determining values of flame spread and smoke density, that test being UL 910.

At the time of the Inquiry, this type of cable had not been accepted under the Electrical Safety Code for use out-of-conduit. Mr. Grant Davidson, the Chief Electrical Inspector in Ontario, explained that satisfactory test results pursuant to UL 910, which is the basis of the BMEC approval, deals only with flame spread and smoke development. It does not deal with Ontario Hydro's concern, which is whether the electrical conductors for high voltage circuits such as fire alarms and firepumps will carry electricity safely.

The evidence indicated that there is a strong possibility that the use of this new type of cable out of conduit will be less expensive than installing cables in conduit. If that is so, there could be a reduction in the cost of electrical installations in both new construction and work done on a retrofit basis.[9]

[1] The *Elevating Devices Act*, R.S.O. 1980, c.135; Supplement to R.R.O. 1980, 229/81.

[2] OFC Subsection 7.2.2.

[3] OBC Clause 3.2.6.11(1)(b).

[4] Canadian Standards Association, *Safety Code for Elevators, Dumbwaiters, Escalators and Moving Walks*; supplement 3-1982 to CSA Standard B44-1975.

[5] See Chapter 15 under the heading "Egress" for further discussion.

[6] See Chapter 10 for a discussion of emergency generators.

[7] The *Elevating Devices Act*, R.S.O. 1980, c.135; R.R.O. 1980, Reg. 794.

[8] Exhibit 132.

[9] Briefs that speak to this issue are: 55 (Dupont Canada Inc.), 82 (Pyrotronics Protection Systems Canada Limited), 92 (Penwalt of Canada Limited).

Chapter 9

Commissioning

The two previous chapters discussed building systems. Building systems must operate as designed when the building is first turned over to the owner. In addition, building staff must be instructed regarding the operation and maintenance of the systems. This chapter will deal with these matters.

COMMISSIONING AND CONSTRUCTION

Recommendation:

9.1 The Ontario Building Code should contain a provision for the commissioning of life safety systems for highrise buildings. The provision should list the elements considered necessary for proper commissioning, thereby creating a functional definition of the term "commissioning" similar to the manner in which "Fire Safety Plans" are described in Subsection 2.8.2 of the Ontario Fire Code.

This recommendation is similar to one contained in the Fillingham Report.[1] The authors discuss what elements should be found in a proper commissioning. The discussion in the Fillingham Report relating to this recommendation states:

> "Commissioning" is the act of putting relevant systems into working order and preparing them for active use. As such, it includes:
>
> — the survey and examination, testing, and proving the performance of components, equipment, systems both during and after construction
>
> — adjusting systems to effect efficient and proper performance with proper interaction of all related systems after construction
>
> — the instruction and training of operating staff before occupancy
>
> To achieve the operational performance quickly and correctly under stress of emergency conditions requires the set-up of a comprehensive fire plan including operating schedules and programmes, and the establishment of contingency alternatives. For some projects the fire plan can be very simple, however, for high buildings, the commissioning must include priorities and sequences in order to:
>
> — isolate fire and prevent spread of fire and smoke
> — execute evacuation from fire zone
> — extinguish fire
> — purge smoke

> Commissioning requires an understanding of all functional systems including automatic sprinklers, manual fire hose systems, gases such as halon, chemicals such as in automatic and/or manual extinguishers, air distribution and pressure of HVAC systems, and electricity in alarms, starters, etc.
>
> Because of the immense complexity of the building occupancies, the systems provided and the diverse responsibilities, it is essential that when required, proper action will be taken. The procedures of commissioning and acceptance must be addressed to "who, when and how" as well as to "what".[2]

The OBC requires the involvement of a professional engineer or an architect in the design and *general review* of the building construction of all highrise buildings. Section 2.4 of the OBC states:

> A person who intends to construct or have constructed a building within the scope of Subsection 2.3.1 [would include highrise] shall ensure that an architect, a professional engineer, or both are retained to undertake,
>
> (a) the design of the buildings, and
>
> (b) the *general review* of the building during construction in accordance with the requirement of the Ontario Association of Architects or the Association of Professional Engineers of Ontario, as applicable.(italics added)

The word "commissioning" does not appear in this section. The requirement for "general review" of the building during construction has not been interpreted universally by the design professionals to require a significant involvement by them in the commissioning phase. For example, the Association of Professional Engineers of Ontario (APEO) has performance standards for its members, but they do not include a proper reference to testing life safety systems as being part of general review or, to use their terminology, "field review". In addition, those performance standards are not mandatory but are regarded as recommended practice only.

The architects appear to have taken a different approach. Mr. Charles Greenberg, Director of Practice for the Ontario Association of Architects (OAA), testified that the OAA considered commissioning to be included in the term "field review". He indicated, however that there is no clear statement that commissioning, as described in this report, is a responsibility to be fulfilled by the architect. In the Brief submitted on behalf of the OAA, Mr. Greenberg stated as follows:

> "Although the Ontario Association of Architects, in conjunction with the Ontario General Contractors Association, have a standard takeover procedure document, the document does not deal specifically with requirements for the testing and turnover of life and fire safety components of a building. Many specifications prepared by individual consultants contain procedures for this process, but these requirements are not standard throughout the profession."[3]

The failure to have proper commissioning has led to inoperative and defective life safety systems. It is therefore my view that there is a need to clarify the role of the design professional in the commissioning stage, and to have commissioning regarded as an essential service to be provided by the design professionals to their clients. Implementation of this recommendation will achieve both of these objectives.

As indicated in the Fillingham Report, commissioning should include the preparation of operating and maintenance instructions for life safety equipment. The testing of fire protection systems as a unified system is important not only during the commissioning stage, but also once the building is occupied and being used. Operating and maintenance manuals should contain the information which will allow the proper testing of all life safety systems during the life of the building.

The evidence indicated that the preparation of operating and maintenance instructions for life safety equipment and systems is not considered part of the normal services performed by a professional engineer. The preparation of these documents is described in their performance standard as "special services" which are provided only when specifically requested by the client (Ex.198(d)).

Redefining the essentials of commissioning to include things such as the preparation of operating and maintenance manuals is an example of the benefit that could flow from implementation of my recommendation.

A number of practicing architects and engineers appeared before the Inquiry, and in my view they all supported the need for an improvement in this most important phase of the construction process. For example, Mr. Goering, a practicing architect, testified that he finds people who are in a position of authority in relation to a building who do not understand the functioning of a building and its components as a whole. He attributed that lack of understanding to insufficient commissioning at the construction phase and/or failure to maintain a continuity of information and understanding which may have been imparted at some earlier time.

Mr. Donald Boehmer, a practicing engineer, testified that he was concerned that testing in new buildings was not being done; and if it was being done, it was being done on an ad hoc basis. He stated that:

> ". . .the contractors and engineers are supposed to be checking out the systems, but they aren't including a proper commission testing of fire protection systems,"[4]

The Province of Manitoba has substantially adopted the NBC as its provincial building code. In 1981, a joint certification team undertook an examination of all highrise buildings in Winnipeg that had been constructed under Subsection 3.2.6. The team tested all required life safety installations including the central alarm and control facility, firefighters elevator, venting to aid firefighting, standpipe and sprinkler systems, and emergency power supplies. While many of the problems that were reported by the team were the result of improper maintenance, a number of the deficiencies were attributable to incomplete or, perhaps, nonexistent commissioning. Eight buildings requiring voice communication and loudspeakers had no provision for silencing the fire alarm sounding devices when the loudspeakers were in use. In two buildings, the key operated switch for the firefighters elevator was never installed. In one case, the fire pump had not been connected to the emergency power supply. With regard to the pressurization of stairwells and elevator shafts, the report of the team stated:

> "It may be difficult to believe, but we did in fact find one pressurization system for elevator shafts and stair enclosures (Measure F) operating in reverse." (Exhibit 145)

I recognize that it is common for large construction projects such as the erection of highrise buildings to involve many design professionals. These design professionals are invariably concerned with a portion of the work only. For example, a mechanical engineer may design an air pressurization system, and an electrical engineer may be responsible for the fire alarm system. Although the operation of the two systems must be coordinated, the respective engineers may complete their portion of work at different times and move to other projects. The difficult issue to be addressed is, by what means does one assure that all integrated life safety systems are tested together before the building is turned over to its owner? In addition, who is responsible for establishing the system which will cause design professionals to return to the building once maintenance and supervisory staff are appointed in order to instruct them on the proper operation and maintenance of the various life safety systems?

Although there was a consensus that improved commissioning of highrise buildings was necessary, there was a difference of opinion as to whether the requirements for commissioning should be left entirely within the domain of the professional associations to be dealt with as part of the regulation of their membership, or whether the provincial legislation should contain some of the particulars.

I have accepted the views of those who advocated a legislative requirement for commissioning. The legislation should set out the elements which would be required to be performed during the commissioning phase in a manner similar to that employed by the OFC in describing fire safety plans. The method for complying with the requirement is properly a subject for the professions themselves to address. Perhaps this issue can be addressed in the Regulations under the proposed new *Architects Act* and *Engineers Act*. While the procedures may be performed by different specialists, it must be clear that the final responsibility for ensuring that the procedures are done, and that the relevant information is made available to the owner, rests with the design professional.

Suggestions were made during the evidence that because fire protection systems in highrise buildings involve cross-disciplines such as electrical and mechanical engineering, consideration should be given to "fire protection systems" being treated as a separate discipline under the design specifications. The rationale for such a proposal was explained by Mr. Boehmer. It was his opinion that if the fire protection systems were treated as a separate part of the contract, there would be one subcontractor who would be responsible for and would understand the separate but interrelated life safety systems. A unified testing of these systems would then be more likely.

The OBC specifically requires the involvement of an architect or a professional engineer in the design of foundations for certain buildings. Mr. Hart, the Director of Legal Services for the APEO, suggested the OBC could require that an engineer be engaged in the design and supervision of the installation of all fire safety systems in a similar fashion.

The suggestions of both Mr. Boehmer and Mr. Hart appear to have some merit. The Inquiry is, however, aware that there may not be a sufficient number of professionals qualified to bid on and undertake the design and supervision of *all* life safety systems. The possible ramifications of implementing these suggestions is not clear and further study would therefore be necessary before either of these suggestions are acted upon.

The quality of any commissioning will be a function of the training and qualifications of those involved. In Chapter 13, I have made recommendations regarding the education and certification of persons who would be involved in the commissioning process. The implementation of those recommendations in conjunction with a clear definition of responsibility and a mechanism providing for the coordination of all necessary participants in the commissioning process will, in my view, improve the level of life safety in highrise buildings.

COMMISSIONING AND FIRE SAFETY PLANNING

In almost every case, a highrise building will be partially occupied before its completion. The need for proper commissioning, including the need for a fire safety plan, is no less important on a partial occupancy of the building than it is when the building is complete. Fire safety plans should therefore be prepared before commissioning, so that they can be implemented during the commissioning stage. The efficient and proper performance of the life safety systems, and the proper reaction of occupants in fire emergencies requires that such a fire safety plan be in effect.

When partial occupancy occurs, an occupancy permit must be obtained pursuant to the Ontario Building Code. In Chapter 15, I recommend that the preparation of a fire safety plan be a condition of obtaining such an occupancy permit.

The Inquiry was advised that the OAA is developing a recommended procedure for the testing and turnover of the life and fire safety components of high buildings. The development of such a procedure is important, especially if it will solve a problem expressed by certain building officials. Those officials indicated that the reports received by the building inspector after field or general review were sometimes difficult to interpret or did not clearly describe what had actually been done by the person who did the field review. There are some standard forms in existence for use when inspecting fire alarms and sprinkler installation, and it was suggested that those forms could be used as model documents or precedents for the development of standard form reports. There was also discussion about the use of a standard letter of commitment from the owner to the OBC inspector.

It appears to me that the development of standard reporting methods could improve the working relationship between the design professionals and the building inspectors. It can only be beneficial to have both parties informed as to what is expected during the commissioning phase, and to provide assurance that the necessary procedures have been done.

In Chapter 15, I discuss fire safety plans. Some major aspects of planning for fire safety are fire prevention and maintenance. In order to properly prepare a comprehensive fire safety plan, an owner must be fully aware of the fire safety systems in the building. In existing buildings, the owner will have to do a building audit before preparing a fire safety plan. Such an audit should be greatly facilitated in new buildings if the commissioning of the building generally included the preparation of operating and maintenance manuals, and the listing of ongoing testing requirements. It is my opinion that the implementation of fire safety plans is one of the most positive, practical and cost effective methods of promoting fire safety. The involvement of the design professionals in commissioning new, renovated or retrofitted buildings, would greatly assist owners in complying with the requirements for planning for fire safety.

[1] "The building code should contain requirements for the procedures of the commissioning of life safety systems for highrise commercial buildings." (at page 114)

[2] *Ibid*. pp. 114 to 116.

[3] Brief 81.

[4] Transcript, Volume 52, p. 19.

Chapter 10

Retrofit

INTRODUCTION:

The cost of installing a fire safety device or fire safety equipment in an existing building is more expensive than the same installation during original building construction. The potential for significant financial impact on building owners and ultimately, on building tenants, due to any retrofit ordered by the Province was a major issue discussed at the Inquiry.

Part 9 of the OFC is entitled, "Retrofit". This regulation will eventually contain all requirements for retrofit in the Province of Ontario. On April 29, 1983, the first retrofit provisions under Part 9 were filed as Ontario Regulation 251/83. That regulation imposes retrofit requirements on assembly occupancies, and on boarding, lodging and rooming houses. Retrofit regulations have been drafted for health care facilities but have not been filed.[1]

The retrofit regulations referred to above were prepared by a Retrofit Task Group. The membership of that group consists of representatives from Government, industry, the design professions, the fire service and other interested groups. The matrix of that Task Group is designed to ensure that all those that can be affected by any retrofit regulation will be represented and have influence on any recommendation made to the Regulations Committee. The only exception to this general statement is that user groups are not represented on this Task Group. This shortcoming is the subject matter of a recommendation in Chapter 2.[2]

Donald Boehmer is a member of the Part 9 Retrofit Task Group. He was questioned regarding the extent to which the possible cost of retrofit is considered by that group, and how decisions are made. He testified that the group "certainly looked at all of the possible retrofit requirements in terms of what the financial impact would be on existing buildings."[3] He agreed with the proposition that recommendations made by that Task Group were based on some consensus in relation to the cost effectiveness of various measures.

Assembly occupancies, boarding, lodging and rooming houses, and health care facilities were dealt with by the Retrofit Task Group before other occupancies because the Task Group decided those occupancies were in need of the most immediate attention. The Inquiry was advised that the Retrofit Task Group has identified highrise buildings as a subject matter to be discussed. They have not, however, decided where in the long list of priorities highrise buildings will be placed. That is, the group will consider retrofit provisions for highrise buildings, but no decision has been made as to *when* that consideration will take place.

I commented in Chapter 7 that there were two basic approaches to codifying the requirements for smoke control in new buildings, the prescriptive approach and the performance approach. Similarly, there are two different methods for requiring retrofit of existing buildings. The Code could list specific requirements and impose them on all buildings. This would be a prescriptive approach. It satisfies the desire for certainty, but may contain requirements that are unnecessary or exceedingly expensive in specific buildings.

On the other hand, one could have a pure performance Code. It would simply require owners to ensure that there is a sufficient degree of life safety in the building, and would require a building-by-building analysis. This would be beneficial where a specific building might be difficult to modify in order to conform with prescriptive standards, but could be shown to have other features which provided the necessary level of life safety.

The approach taken by the Retrofit Task Group in drafting the first sections of the Part 9 Retrofit Code is to set out prescriptive standards, and to allow, as an option, a life safety study of a specific building. An owner who chooses to do a life safety study must identify the prescriptive requirements he cannot meet, describe how an acceptable level of life safety can be achieved in his building, and prepare a time schedule for compliance.

In order to ensure life safety in a highrise building there are certain elements which can be considered essential. In a study brief prepared by Donald Boehmer of Rolf Jensen and Associates, a witness called on behalf of the office industry, certain basic fire control mechanisms were listed:

Apartment Buildings:

— walls separating apartments from each other and apartments from corridors, should form an effective fire and smoke separation
— all openings in these separating walls should be sealed to provide an effective fire and smoke stop
— corridor doors should be provided with self-closing devices
— the building fire alarm system should be checked and tested [note that this assumes the existence of a fire alarm system]
— the integrity and adequacy of the building egress systems should be verified
— buildings should contain a standpipe system that is operational
— an elevator that can be captured and used by firefighters should be provided.

Office Buildings:

— exit systems should be properly designated and separated
— any penetration of fire separations should be fire stopped
— there should be communication of the fire alarm signal to a responding fire station [note that this assumes the existence of a fire alarm system]
— a standpipe system should be provided
— buildings should be upgraded where the building contains conditions or features that create a fire safety hazard
— an elevator that can be captured and used by firefighters should be provided.[4]

Regulations drafted and filed by the Retrofit Task Group address similar issues. For example, the regulations for assembly occupancies contain specific requirements for:

— fire separations between major occupancies
— protection of openings in fire separations (including doors)
— fire separation of hazardous areas
— access to exits (number and location)
— emergency lighting

- — marking and signs
- — stairway separation
- — fire alarms.

In addition, and as an option to providing the specific items prescribed in that Code, the regulation sets out the following requirements for a life safety study:

> 9.1.4.2(1) A Life Safety Study shall deal with but is not limited to the following:
>
> (a) containment:
>   (i) fire separations
>   (ii) fire walls
>   (iii) construction assemblies
>   (iv) occupancy separations
>   (v) interior finish.
>
> (b) detection:
>   (i) alarm and detection systems
>   (ii) voice communication systems.
>
> (c) suppression:
>   (i) fire department access
>   (ii) standpipe and hoses
>   (iii) sprinklers or special extinguishing systems
>   (iv) fire fighter elevators.
>
> (d) egress:
>   (i) exits (type, access to, direction to, lighting for, identification of, number from rooms, etc.)
>   (ii) fire escapes
>   (iii) occupant load
>   (iv) emergency lighting.

Some witnesses urged that my report should give direction to the Retrofit Task Group regarding possible retrofit items, but should refrain from recommending specific fire protection devices or measures be installed or undertaken. Their reasoning was that the Retrofit Task Group was a more appropriate forum for considering technical matters and cost effectiveness, and arriving at a consensus of all interested or affected parties.

Those that could be affected by retrofit provisions were represented before this Inquiry. In many cases, a consensus regarding specific fire safety matters was achieved during the Inquiry itself. In those cases, I believe it is appropriate to make specific recommendations which reflect that consensus. I suggest that the Retrofit Task Group simply add those consensus items to their recommendations for retrofit of highrise buildings. In other cases, the weight of the evidence in favour of certain retrofit measures is so overwhelming that any opposition to it has not convinced me to refrain from making a specific recommendation. There are matters which require further study, either because technical considerations necessary for making a final decision are beyond the competence o the Inquiry, or because there was insufficient evidence to come to a final decision.

While I will be making recommendations with regard to several specific fire safety matters, a large number of issues remain to be addressed by the Retrofit Task Group. For example, while I will be discussing the need for fire rated doors, the use of such a door is based on an assumption that it will be used as a closure *in a fire separation*, that is, in a wall that has a fire resistance rating.

In making my recommendations regarding retrofit, I will clearly identify those items which were agreed to by all interested parties. I believe that without this Inquiry, the consensus on certain items would have been delayed, if reached at all. In my view, the consensus which has resulted is one of the positive results of the Inquiry process.

Standards for Retrofit:

In general, the policy advocated by all of those who discussed this issue is that, where specific items are required on a retrofit basis, the standards applied to that item should never exceed the standard set out in the current OBC for new construction. It appears to me that this policy has been carried into practice, because any standards for specific items which are prescribed in the first Retrofit regulations passed under Part 9 of the OFC do not exceed the OBC, and where appropriate are less stringent than the standards in the Ontario Building Code.

Where specific items of retrofit are required in the Retrofit Code, owners will find it easier to comply if standards are described with some specificity. It will be necessary to be more flexible in situations where the owner has prepared and submitted a life safety study. In those cases, standards for certain installations required in the Retrofit Code might indeed have to be higher in order to offset the inability in a specific building to meet minimum standards for other installations. For example, the Retrofit Code might require highrise buildings to have two exit stairwells and single station battery-operated smoke detectors in each suite. A life safety study might be done for an old building that had exit stairwells with separations having a lower fire resistance rating than present code requirements. In this situation, the owner might propose the installation of electrically connected heat detectors tied into the fire alarm system in all suites, a standard much higher than the code requirement for in-suite detectors. This could ensure that all occupants would have early notification of a fire, and be able to evacuate using the stairwells.[5]

Timing:

The issue of timing for retrofit is dealt with in the first portion of the Part 9 Retrofit Code, filed in April of 1983.

> Subsection 9.1.3 Schedule of Compliance
>
> 9.1.3.1 It is the responsibility of the owner to comply with the requirements of this Part within one (1) year after the day this Regulation comes into force.
>
> 9.1.3.2(1) The owner or his agent may apply to the Chief Fire Official for an extension of time not to exceed two (2) additional years from the date of compliance referred to in Article 9.1.3.1.
>
> (2) A proposed schedule for completion of the work shall be submitted with the application for extension of time.

I do not believe that, in most buildings, it will be necessary to undertake substantial modification in order to comply with my recommendations for retrofit. In situations where major changes must be made, I believe it is appropriate to put the onus on the owner to apply for an extension of time and to satisfy the Chief Fire Official that the extension is required to allow the owner to have the work done or to modify the financial impact, and that his schedule is reasonable.

THE COST OF RETROFIT:

Apartments:

Most highrise buildings in Ontario are apartment buildings.[6] In condominium apartments, the owners of the individual units will be affected by any retrofit provisions. In the case of rental apartments, the landlord will pass on the cost of complying with any retrofit provisions to the tenants. The assessment of the possible financial impact of retrofit for apartment buildings will therefore be expressed on the basis of both the cost per unit and the rental increase per month per unit.

Submissions regarding the retrofit of apartment buildings were received from both those with and without standing. Those with standing assisting the Inquiry with this very important issue included UDI, HUDAC (Ontario Council), MTABA, OAFC, the Federation of Metro Tenants Associations, CIPREC, BOMA, CASA, and the City of Toronto.

The questionnaire distributed to residents of highrise apartment buildings (Exhibit 185) canvassed their desire for more fire safety devices, whether they were willing to have their rent increased to help defray installation costs, and if so by what percentage they would be willing to have their rent increased.[7] There were differences in responses, depending upon the socio-economic status (SES) of the respondents. The following excerpt from Dr. Cavoukian's report deals with these three matters:

"More Fire Safety Devices Wanted

Question 16: Would you like to have more fire safety devices installed in your building? (Sprinklers, voice communication, door closers, etc.)?

> The great majority of the tenants — 71.3%, responded affirmatively to this question. A higher number of those in medium and low SES buildings wanted more safety devices installed in their buildings than did those in high SES buildings. This is not surprising since those in high SES buildings already reported having a greater number of existing safety devices such as sprinklers and a voice communication system than those in the other buildings.

Increase Rent to Help Defray Installation Costs?

Question 17: If "Yes" in question 16: Would you be willing to have your rent increased to help defray the cost of installing fire safety devices?

> Roughly half of this group (who wanted more fire safety devices) — 53.8%, answered that they would be willing to have an increase in their rent to help defray installation costs; 46.2% said that they would not be willing to have an increase in their rent for that purpose. The majority of those who were willing to have an increase in their rent were those residing in high SES buildings (91.9%), followed by medium SES buildings (54%), and then low SES buildings (39.1%).

Percentage of Rent Suggested for Increase

Question 18: If "Yes" in Question 17: What percentage of your rent would you be willing to have increase? ...%.

> In response to this question, the amount of the increases ranged from 1% to roughly 10%: 80% of those who were willing to have their rent increased indicated that an increase between 1% and 5% would be acceptable. This data may be found in Table 9. Once again, those who were willing to have a higher [average] percentage of their rents increased were those residing in high SES buildings (X = 5.9%) followed by low SES buildings (X = 4.8%) and medium SES buildings (X = 4.3%).

TABLE 9

RESPONDENTS WHO WANTED MORE FIRE SAFETY DEVICES AND THOSE WHO WERE WILLING TO PAY INCREASED RENTS FOR THIS PURPOSE

	RESPONDENTS WHO WANTED MORE FIRE SAFETY DEVICES		RESPONDENTS WILLING TO PAY INCREASE IN RENT		AVERAGE RENT INCREASE
	No.	%	No.	%	X
HIGH SES	39	49.9	34	91.9	5.9%
MEDIUM SES	203	76.3	109	54.0	4.3%
LOW SES	96	77.4	36	39.1	4.8%

Note: It cannot be assumed that the views of the various SES groups reported in this table are representative of the views of the *Ontario* population which might fall within any one SES group. The data should be regarded as directional only.

To determine the views of various SES groups on a province wide basis would have required a demographic sampling of the entire province. No attempt was made to do this for the purposes of this study."

The apartment industry costed the financial impact of retrofitting an apartment building with the following items: sprinklers, smoke alarms, door closers, firefighter elevators, voice communication systems, and emergency power. The present OBC standards for new construction were used.

Mr. Fillingham prepared the specifications for this work. He testified that these items were chosen because they are, in his opinion, the items most often referred to when retrofit of apartment buildings is discussed. The specifications describe the buildings selected for study. They state:

"BUILDING SELECTION

The two apartment buildings were selected to typically represent the majority of the existing high rise apartment building stock in terms of:
- period of construction
- general construction features
- building height and plan configuration

The intent was to select buildings constructed in the late 1960's prior to the Ontario Building Code and just prior to the 1970 National Building Code which contained extra requirements for high buildings and would have been enforced either by C.M.H.C. and/or municipal buildings bylaws.

The typical high rise apartment building in the Province is constructed of poured in place concrete including floor slabs and shear walls and/or concrete columns and infill walls of masonry. The structural skeleton then is a concrete layered cake of unit compartments.

High rise apartment buildings are typically between ten and twenty-four stories. The plan is formulated around a corridor containing vertical stairwell shafts at the ends of the corridor and elevator and related service shafts at the centre.

The suites are laid out each side of the corridor forming the economical "double-loaded" corridor configuration. Balconies are generally provided for each suite.

The two buildings located at 3969 Kingston Road and 273 Pharmacy Avenue in the Borough of Scarborough are typical of the criteria outlined hereabove. A detailed description of each building is provided in the following specification.

FEATURES FOR RETROFIT

The six features selected for retrofit purposes include five requirements contained in the Ontario Building Code for high rise apartment buildings. These requirements are:

- the installation of smoke alarms in dwelling units
- the installation of door closers on the entrance to dwelling units
- the provision of an elevator dedicated for use during an emergency
- the provision of a voice communication system and the associated central alarm and control facility
- the provision of emergency power for the life safety systems.

Total sprinklering of the buildings was selected as a retrofit feature not because it is a requirement of the Ontario Building Code but to develop the economic impact of a retrofit feature publically touted by a number of interest groups.

THE APPROACH

To convenience the understanding of the implications of each retrofit feature, the specification describes the complete work to undertake each feature on a stand alone basis. The result is that the description of the work and the resultant cost represents the total impact of the particular feature including the related Mechanical and Electrical work and the Architectural work to cut, patch, repair, and refinish to a level equal to the existing quality of finish.

The Specifications and the Cost Report together develop the evidence relating to the hard construction cost impact of each feature."[8]

An architect's fee of 10% of the value of construction would also be imposed.[9]

Each item in the estimate was costed on a "stand alone" basis, and the resulting prices then totalled. This is not an altogether accurate way of arriving at a total cost in any specific case because, as a practical matter, the *work* would probably not be done on a stand alone basis. I would expect that any reasonable owner would choose the most economical method of organizing the work.

Reproduced below is the "Estimate Summary" for the two apartment buildings in question, as submitted by the apartment industry.

Project: RETROFIT APARTMENT STUDY Date: January 24, 1983
273 PHARMACY AVENUE
3969 KINGSTON ROAD, TORONTO Rev. March, 1983

ESTIMATE SUMMARIES

The following are the total estimates for each section under each subject property.

		Total Cost	Approx. Cost per Suite
273 Pharmacy Avenue (280 Suites)			
Sprinklering		$ 981,000	$ 3,504
Smoke Alarms		$ 7,390	$ 27
Door Closers		$ 18,750	$ 67
Fire fighters elevator		$ 43,195	$ 154
Voice Communication		$ 76,560	$ 273
Emergency Power		$ 73,520	$ 262
	TOTAL	$1,200,415	$ 4,287
3969 Kingston Road (173 Suites)			
Sprinklering		$ 750,100	$ 4,335
Smoke Alarms		$ 4,560	$ 27
Door Closers		$ 11,580	$ 67
Fire fighters elevator		$ 30,490	$ 176
Voice Communication		$ 62,700	$ 363
Emergency Power		$ 76,890	$ 444
	TOTAL	$ 936,320	$ 5,412
Total cost of both buildings (rounded)			$2,136,735

Another cost analysis was submitted by the City of Toronto. They also chose an apartment building constructed before 1970. The size and construction were comparable to the buildings chosen as examples by the apartment industry. Information from their Retrofit Cost Analysis follows:[10]

RETROFIT COST ANALYSIS

Typical *apartment* building in the City of Toronto

General Data:

Date of construction: 1968
Building area: 8,000 sq. ft. (160′ × 50′) approximately
Building height: 23 storeys (above grade) 200 ft.
+ 2 basements (below grade)
Number of dwelling units: 230
11 on typical floors
Area of typical unit: 800 sq. ft. ± (gross floor area)

	Average unit price 1	Total Cost 2	Cost per Dwelling 3
Self-closing device	$ 50.00 each		$ 50.00
Products of Combustion detector	$ 40.00 each		$ 40.00
Voice communication system		$ 50,000.00	$ 220.00
Emergency power supply		$ 20,000.00	$ 90.00
Elevator door re-opening device	$2,200.00 each	$ 6,600.00	$ 30.00
Sprinkler system	$ 1.00 sq. ft.	$184,000.00	$ 800.00
		TOTAL	$1,230.00

NOTE: Column 2 does not include soft costs

The major differences between the two estimates are in the costs for sprinklers, emergency power and firefighters elevator/elevator door re-opening device. I will comment on these differences under the appropriate headings.

In this report, I do not recommend extensive retrofit of sprinklers for apartment buildings. If the estimated cost for sprinklers is removed from all of the estimates, the total cost per suite for the remaining five items, as estimated by the apartment industry and the City of Toronto is:

Estimate Summary:
$ 783.00 per suite (Pharmacy Avenue)
$1,077.00 per suite (Kingston Road)

Retrofit Cost Analysis:
$ 430.00 per suite (City of Toronto)

I do not believe the five items used in this calculation need be retrofitted to the OBC standard employed in the preparation of the "Estimate Summaries". The use of a reduced standard for these items would, of course, reduce the cost and thereby the rental increase required.

Detailed calculations were made by witnesses called by the apartment industry to demonstrate the way in which capital expenditures would be passed on to tenants in rent controlled buildings. Mr. John Bassel, president of the Metropolitan Toronto Apartment Builders Association, testified that in rent controlled buildings, for every $1,000.00 borrowed at 15% interest, based on the amortization he believes the Residential Tenancies Commission would allow (15 years), the rental increase would be $13.70 per month. Based on a monthly rent of $350.00, this would result in a 3.9% increase in the rent for every $1,000.00 spent on retrofit per suite. The rental amount of $350.00 was chosen by Mr. Bassel as being representative of the rents charged in the two buildings chosen for the study.[11] Where the current rent is *higher* than $350.00 the percentage of rental increase per $1,000 will be *lower*.

As indicated, the tenants who responded to the questionnaire prepared for the Inquiry were willing, on average, to pay a rental increase of approximately 5% of their present rent for improved fire safety devices. Dr. Cavoukian cautioned that her report was directional only. The Inquiry did, however, hear evidence in relation to this matter from two persons who have been actively involved with tenants for many years. Mr. Dale Martin, Chairman of the Federation of Metro Tenants Associations, and Mr. Fred Bever, a Community Legal Worker from Parkdale Community Legal Services, both believe that tenants are willing to pay an increased rent if they receive something specific in return. Mr. Bever expressed the opinion that tenants were usually reluctant to pay an increase in rent where the increase arose through the refinancing of the building by using the acquisition cost provisions of the *Residential Tenancies Act*. His view was, however, that tenants who saw a smoke detector, a door closer, a fire alarm, or some other fire safety equipment being installed, would not be reluctant to pay an increased rent.[12]

There was considerable discussion regarding which buildings would be financially affected by the above retrofit items. There was also a difference in the way the apartment industry and the City of Toronto calculated the impact of retrofit on rents. In my view, the evidence can be summarized as follows:

- in buildings built after 1975, in accordance with the OBC, there will be very little retrofit required at all, and therefore little impact on rent
- in buildings built with CMHC financing, which were built in accordance with the NBC, there will be very little retrofit required at all, and therefore little impact on rent
- other rental buildings can be broken down into three groups: non-rent controlled buildings, assisted housing, rent controlled buildings,
    - *non-rent controlled buildings* are buildings built after 1975 or buildings where rents are over $750.00 per month. Because of their date of construction, or based on the information given about these buildings by tenants in the Cavoukian Report, there will be very little retrofit required at all in these buildings, and therefore little effect on rent
    - *in assisted housing*, rent is geared to income. The cost of retrofit would not be borne directly by tenants, but would be borne by the taxpayer
    - *in rent controlled buildings*, the cost of retrofit would be a capital expenditure which would be passed on to the tenants using methods allowed by the Residential Tenancies Commission.

At the present time, capital expenditures for retrofit would be treated the same way as other capital expenditures, by the Residential Tenancies Commission. An issue arose as to whether capital expenditures incurred in order to comply with retrofit regulations should be dealt with differently. It is my view that the Commission of Inquiry into Residential Tenancies is the proper forum to deal with this issue.

With two exceptions, my recommendations for retrofit of apartment buildings will not impose a higher standard than the Ontario Building Code. As a result, most recommendations will not affect apartment buildings constructed pursuant to the Ontario Building Code. It is my understanding that buildings constructed with CMHC financing since the early 1970's were built in accordance with the National Building Code. As the NBC and the OBC are similar, my recommendations should not have a significant impact on those buildings, either.

The two exceptions referred to are: first, the requirement for smoke detectors is a recent addition to the OBC, and many apartments may not have them; second, where existing buildings do not have balconies and do not in some other way comply with the *smoke control requirements of the NBC*, I have recommended the installation of smoke barrier doors.

Hotels:

I will be making some recommendations for the retrofitting of certain items in hotels. It is very important to keep in mind that hotels have been subject to retrofit legislation since 1971. For this reason, many of the items that I have recommended for apartment buildings have already been installed in hotels. This will reduce the impact of new retrofit legislation in most hotels, although there may be some impact on hotels built before 1971. Of course, any requirement for retrofit in hotels which imposes a standard higher than the present HFSA will have an economic impact. This economic impact will be affected by the length of time that owners are given to comply with this requirement, the standard which the installation will have to meet, and the way in which owners choose to pass this cost on to hotel users. Hotels are in a competitive market and must establish room rentals to match other hotels and to attract clients. If it is necessary to increase the cost of room rentals to cover the cost of retrofit, owners should be comforted by the knowledge that all other similar hotels will be incurring similar costs.

Offices:

My recommendations for retrofit of office buildings do not impose standards higher than the current Ontario Building Code. The greatest impact will be on older office buildings which do not have a fire alarm system, a voice communication system, or a proper method of ensuring water supplies for firefighting.

I accept the evidence of Mr. Christopher Cornish that costs incurred by building owners will be passed on to tenants in the form of higher rent.[13]

Institutions:

Many of these buildings are maintained at public expense. For that reason, the cost of retrofit will be passed on to the taxpayer.

I appreciate that there are privately owned buildings that would qualify as institutions. There was no evidence heard by this Inquiry about the impact of the cost of retrofit on those buildings or the way in which those costs would be passed on.

ITEMS FOR RETROFIT:

Self-Closing Doors:

Recommendation:

10.1 In highrise residential buildings each entrance door to a room or suite should be equipped with a self-closing device.

An open entrance door to the room or suite of fire origin provides an avenue for the spread of fire and smoke throughout the building. A door closer, if properly installed and maintained, ensures that the door will be closed after the occupants leave the room or suite.

The disasterous results that can occur when doors are left open were evident in the fire at 88 Bloor Street East described in Chapter 3, and in the Westchase Hilton Hotel in Houston, Texas described in Chapter 4.

The Ontario Housing Corporation statistics reinforce the need to have self-closing devices on these doors. In 1981, OHC statistics indicated that 72 of 93 people leaving suites of fire origin in highrise apartment buildings left the door open.[14]

There was a consensus that self-closing devices were required as a retrofit item for apartment buildings. The only reservation regarding self-closing devices was voiced by Mr. Ronald Brown. Mr. Brown has cerebral palsy and is confined to a wheelchair. He was concerned that with a self-closing device, he would, on an everyday basis, have difficulty opening the door to his apartment. In some cases, handicapped persons might also be unable to exit the apartment before the door closed. In a fire emergency it is undesirable to have persons with this type of handicap faced with another obstacle impeding their egress from the apartment and the building. In my view, this problem should be addressed on a case-by-case basis. Alternate types of self-closing devices might be usable. If absolutely necessary, the power should be given to the Chief Fire Official to dispense with the requirement for a self-closing device.

Mr. Hess did not believe that the retrofitting of door closers in hotels was necessary. In his view, hotels should be treated differently than apartments (where all participants in the Inquiry recommended self-closing devices) because in hotels, signs are posted in rooms which instruct occupants to "close the door". In addition, hotel owners have the opportunity to educate each guest through pamphlets and educational material distributed on arrival or left in guest rooms.

I agree with Mr. Hess that the opportunity to educate hotel guests is one way of approaching the problem of the open door. Having regard to the excellent work he is doing in hotel fire safety, there is reason to believe that education alone *may* work. It is my view, however, that ensuring that the room of fire origin remains a fully enclosed fire compartment is of such importance that door closers are a desirable retrofit item, even in hotels.

The proposed amendments to the OBC adopt the NBC provision which allows these doors in hotels to be self-locking.

Doors which lock automatically, once closed, provide greater security for guests. In a fire, however, this feature may cause guests to be locked outside of their rooms in a fire emergency, particularly if they leave their room and have to return because of fire conditions. Some witnesses were concerned that the combination of a self-closing device and self-locking device could result in guests unintentionally locking their door behind them in a fire emergency.

If the door to the room of fire origin is left open, every person in the hotel is at risk. In my view, any reduction in safety because of this combination must be overcome through an educational process which would encourage hotel guests to carry the keys to their rooms at all times.

Fire Rated Doors:

Recommendation:

10.2 In highrise residential buildings all entrance doors to rooms or suites should have a 20 minute fire protection rating. However, existing 1¾ inch thick solid core wood doors

> ***should be acceptable, and existing solid wood frames having a minimum nominal thickness of 2 inches should be acceptable for a 20 minute door assembly.***

A self-closing device is designed to close the door to prevent the spread of fire and smoke from the suite or room of fire origin. It is my understanding that if the door does not meet the minimum specifications referred to in this recommendation, the door will not withstand flame for a sufficient period of time. For example, in the fire at 170 Lees Avenue in Ottawa described in Chapter 3, the door to the suite of fire origin burned completely. Perhaps more importantly, the entrance door to the apartment across the hall curled up and came off its hinges due to the heat. Neither was a solid core wood door. On the other hand, a solid core wood door across the hall from the suite of fire origin at 88 Bloor Street East described in Chapter 3, maintained its integrity in similar circumstances even though it was exposed to the heat for over two hours. The door protected an elderly occupant of the apartment who remained in her suite throughout the fire incident.

Mr. George Fleming, the Chief Building Official of Scarborough, and a witness called by the apartment industry, was asked whether the doors to apartment suites should have a fire rating. He replied:

> "The answer to that is yes, and the followup question is what fire rating, I suppose, and whether or not it's a labelled rating or not. Obviously, they should have a sufficient capacity in the closed position to contain a fire in a suite until it can be extinguished."

He also indicated that such a door should not be a hollow door. He stated that if properly installed a solid core wood door with latching and self-closing devices would probably perform very well.[15]

The retrofit provisions of Part 9 of the OFC for assembly occupancies accept the principle that solid core wood doors are acceptable in lieu of a door which has a 20 minute fire protection rating.

There was no evidence before the Inquiry as to the cost of implementing this recommendation, nor the number of buildings which would be affected.

The regulations passed pursuant to the HFSA have required 1¾ inch thick solid core doors since 1971. This section refers to hotels built or added to after 1971. My only comment is that this requirement should be extended to all highrise hotels, including hotels constructed prior to 1971.

Recommendation:

> ***10.3 In highrise buildings, all doors to exit stairwells should be equipped with a self-closing device and a latching device.***

In a fire emergency the doors to exit stairwells must remain closed to prevent the migration of smoke into the stairwells.

The results of the failure to have a latching device on stairwell doors can be seen in the description of the fire at the Inn on the Park, described in Chapter 4.

Signs:

Recommendation:

10.4 All highrise buildings should have clearly visible signs showing floor numbering on both sides of stairwell doors, identifying exit doors, and identifying re-entry doors where stairwell doors are locked from the inside. Signs regarding elevator use should also be installed.

The importance of the signs referred to in this recommendation are discussed in chapters dealing with education, fire safety plans and egress. In my view, these signs are necessary for safe egress.

Products of Combustion Detectors:

Recommendation:

10.5 In highrise residential buildings other than hotels, single station smoke alarms should be installed in each suite in accordance with the standard described in Sentence 3.2.4.7(1) of the Ontario Building Code.

There was a consensus that single station smoke alarms should be retrofitted in all apartment suites. The consensus was, however, limited to battery operated smoke alarms.

The source of power for smoke alarms can be either a battery or the normal electrical service in the building. In the latter case, a wire connects the alarm to an electrical panel.

I have recommended the hardwired smoke alarm because in my view, it is more likely to be functional when required than a battery-operated alarm. When installing hardwired smoke alarms, OHC have connected them to the same circuit which provides an essential service, for example the bathroom light. They do this because one is less likely to disconnect their smoke alarm if it will affect other electrical services in the apartment.

The cost of $27.00 per alarm shown on the "Estimate Summary" prepared by the apartment industry relates to a battery operated alarm. The Inquiry was advised that a hardwired smoke alarm would cost an additional $20.00, not including cosmetic repair.

Since the end of 1977 every OHC dwelling unit has been protected by at least one hardwired smoke alarm. Of 600 fires analyzed since 1975, OHC has estimated that lives have "possibly been saved" by smoke alarms in 33% of the fires.

Recommendation:

10.6 In highrise hotels, single station smoke alarms of either the battery-operated or hard-wired type should be installed in each hotel room or suite.

Mr. Hess advised the Inquiry that in hotels constructed or added to since September, 1971, guest rooms or suites have been equipped with sprinklers or heat detectors or smoke detectors electrically connected to the fire alarm system.

The proposed amendments to the HFSA regulations include a requirement that in hotels built before 1971, hotel bedrooms or suites will be required to have sprinklers or heat or smoke detectors in them, electrically connected to the fire alarm system. As an option, subject to certain conditions, *smoke* detectors in corridors serving those areas will be acceptable.[16] These corridor smoke detectors will have to be electrically connected to the fire alarm system, and the walls between the bedrooms and corridors will have to be proper fire separations. This system would allow persons outside the room of fire origin to be notified and to evacuate before exit routes become untenable.

My recommendation requires a smoke alarm to be retrofitted in hotel rooms or suites even where there is presently an existing sprinkler or heat detector. Although the argument can be made that in these situations installation of a smoke alarm is redundant, I cannot agree. The evidence heard by the Inquiry confirms conclusively that *smoke* detectors will provide earlier notification of fire than a detection device activated by heat (sprinkler or heat detector). In my view, the hotel guests should, just as the apartment residents should, be entitled to the level of protection afforded by a *smoke* detector.

Mr. D.J. Beesley during his testimony as to the benefits of smoke detectors referred to a booklet written by Dr. John Bryan entitled, "Fire Suppression and Detection Systems".[17] This booklet praised the work done by OHC in its smoke detector program and states:

> "It would appear the development of efficient, effective and economical *residential smoke detectors* may have been the most important fire protection development of the past decade."

While I do not disagree with the amendments advanced by Mr. Hess in proposed Section 56, which are in my opinion entirely justified given the unique features of hotels as described in Chapter 4, a smoke alarm is needed to provide effective life safety.

Finally, I do not believe that the reasons for recommending hardwired smoke alarms in apartments apply in hotels. I am therefore satisfied that battery-operated smoke alarms may be installed in hotels in lieu of hardwired smoke alarms.

Voice Communication:

Recommendation:

10.7 One way voice communication should be installed in all highrise buildings. Except for institutions, this requirement should apply only to buildings more than twelve storeys in building height. In addition there should be an emergency power supply for voice communication.

In Chapters 13 and 14, the desire for information during a fire emergency, and the need for such information is canvassed in detail. As stated by Dr. Bryan:

> "There is nothing worse than knowing something is going on, but you don't know what. It is a very uncomfortable situation, a very high anxiety level, until you find just what are the dynamics going on in that situation. The question that people always ask when they see fire apparatus or hear fire apparatus is, 'Where is the fire?'"[18]

The apartment industry agreed that it is important for people to be given information during a fire, but thought there might be alternatives to the retrofitting of a conventional voice communication system. For instance, the Inquiry was advised that it is possible to install equipment in a highrise building which will transmit messages through television sets. The messages can be conveyed in a printed form by use of a character generator, or by voice.[19] The cost of installing such equipment ranges between $3,000.00 and $6,000.00 per building.[20] Although this type of system was suggested by some witnesses as an alternative to retrofitting a voice communication system, it is my view that one way voice communication is required. The major drawback of a character generator is that once an occupant leaves the suite, the ability to communicate with that occupant is lost.

In new construction the OBC requires the installation of voice communication systems in apartment buildings, offices, and hotels over twelve storeys in height.[21] It also requires an emergency power supply capable of operating that system for at least two hours.[22]

Any voice communication which is retrofitted should provide a mechanism to silence the fire alarm when the voice communication system is activated.

Cost estimates for voice communication ranged from $10,000.00 to $76,560.00. This wide variation was the result of different standards being applied by the persons making the estimates. Amounts quoted to the Inquiry also varied depending on whether the prices given were actual installation costs or estimates. It is important to note that the cost of the actual installations were significantly lower than the estimates that were given to the Inquiry. The voice communication system costed at $76,560.00 by the apartment industry as contained in their "Estimate Summary" included two-way communication handsets. This recommendation is not intended to require that equipment.

The price of $76,560.00 also included the cost of providing emergency power for the system by batteries.[23] While the Estimate Summary does not identify the cost of providing a battery operated emergency power supply separately from the rest of the system, I assume it is a small proportion of the total cost of a voice communication system.

Mr. Gringorten, Senior Vice President, Property Administration, Olympia and York, a witness called on behalf of the office industry, testified that voice communication is an essential retrofit item for highrise office buildings. He advised the Inquiry that all of the highrise office buildings in his portfolio have been retrofitted with voice communication. In his evidence, he described the evacuation procedures for the First Canadian Place in Toronto, a 72 storey building. It was his view that in a very tall office building, phased evacuation must be used. Based on his extensive experience in managing highrise office buildings, it was his view that phased evacuation is impossible without voice communication.[24]

There was no evidence about the appropriate height at which institutional buildings should have voice communication installed on a retrofit basis. However, the draft regulation for health care facilities proposed by the Retrofit Task Group suggests that such a system should be required in buildings over six storeys in building height. This appears reasonable.[25]

Fire Alarm Systems:

Recommendation:

10.8 All highrise buildings should have a fire alarm system.

There are highrise buildings that do not have a fire alarm system at all. There are others where the system is terribly outdated.

Automatic fire alarm systems are absolutely essential. Without one, an effective fire safety plan as mandated by the OFC cannot exist. Without a fire alarm system, there is no guarantee that all occupants of the building will be aware of a fire emergency.

No evidence before the Inquiry suggested that a fire alarm system was not essential in every highrise building. In relation to retrofitting fire alarm systems in highrise buildings, Roy Philippe stated:

> "The fire alarm system is a fundamental part of the life safety system in a building. It is a fire communication system, so if you ask me whether I feel that it is an essential part of the life safety system in a building, I would say 'yes'."[26]

Mr. Donald Boehmer in listing those requirements which were essential for minimum life safety in highrise buildings assumed the existence of a fire alarm system.[27] In my view the need for a fire alarm system was a matter of consensus.

There was no evidence on the cost of the installation of a fire alarm system. Regardless of the cost, I am of the view a fire alarm system must be installed immediately.

The OBC requires emergency power for the fire alarm system in new highrise buildings. There was no discussion regarding the need for the fire alarm system to have emergency power on a retrofit basis. It is my understanding that the cost of providing emergency power can vary depending upon whether the existing fire alarm system is designed to operate on AC or DC power. Batteries are compatible with DC systems. If however the existing fire alarm system operates on AC power, and if emergency power is to be installed, the owner would have to compare the cost of installing a small generator to the cost of providing batteries and making necessary alterations in the system.

Comments about the need for direct connection of fire alarm systems to the fire department are found in Chapter 3.

Water Supply for Firefighting:

Recommendation:

10.9 All highrise buildings should have an emergency power supply for fire pumps and ancillary equipment, or should have a siamese connection for the standpipe and hose system.

Loss of water pressure during a firefighting operation can result in a fire growing unchecked, and can pose an extreme danger to building occupants and firefighters. When this problem occurred during the fire at 88 Bloor Street East described in Chapter 3, firefighters were exposed to intense heat and had to retreat from the fire floor. In that case, they were able to regain water pressure by connecting their pumpers to the siamese connection.

Emergency Lighting:

Recommendation:

10.10 In all highrise buildings, emergency lighting should be provided for all corridors and exits.

The apartment industry agreed that it is important for people to be given information during a fire, but thought there might be alternatives to the retrofitting of a conventional voice communication system. For instance, the Inquiry was advised that it is possible to install equipment in a highrise building which will transmit messages through television sets. The messages can be conveyed in a printed form by use of a character generator, or by voice.[19] The cost of installing such equipment ranges between $3,000.00 and $6,000.00 per building.[20] Although this type of system was suggested by some witnesses as an alternative to retrofitting a voice communication system, it is my view that one way voice communication is required. The major drawback of a character generator is that once an occupant leaves the suite, the ability to communicate with that occupant is lost.

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Emergency Lighting:

Recommendation:

10.10 In all highrise buildings, emergency lighting should be provided for all corridors and exits.

The evidence is that egress from a building can be severely restricted or in some cases prevented if adequate lighting is not available to allow a person to leave the premises during a fire emergency.

The "Estimate Summary" prepared by the apartment industry estimated that emergency power retrofitted pursuant to the OBC standard would cost $73,250.00, or $262.00 per suite for the Pharmacy Avenue property. This included the cost of emergency lighting. Of this total figure, the estimated cost to upgrade the existing emergency lighting system was $5,940.00, or $21.00 per suite. This figure included mark-up, overhead and profit, and contingency.

The apartment industry agreed that emergency lighting should be provided on a retrofit basis. I agree with their submission that the period of time the emergency lighting must be able to operate should be clearly specified.

Emergency Generators:

Recommendation:

10.11 In all highrise buildings that have emergency generators, a manual start device for such generators should be located at grade, or near enough to grade that it will be easily accessible in an emergency situation.

In the fire at 88 Bloor Street East, the emergency generator was on the 38th floor. The main power supply was lost, and the emergency generator failed to come on automatically. The manual switch was located next to the emergency generator. The firefighters were unable to make their way to the 38th floor to turn on the generator manually until after the fire was extinguished some two hours after their arrival. In Chapter 3, I have described all of the difficulties caused by the failure of the emergency power system. Had the manual switch been located as recommended, the generator could have been activated with little delay.

The CSA Standard for Emergency Electrical Power Supply for Buildings is C282-1977. That standard *recommends* that the generator sets themselves be located within one storey of grade but it does not require them to be so located.[28]

Rashmi Nathwani is a member of the CSA Committee which prepares this standard. As a result of questioning by Commission Counsel, Mr. Nathwani wrote to the Secretary of the Technical Committee of CSA C282 and proposed an amendment to the standard which is similar to this recommendation. If that change is made it will only have effect in new construction. I agree with his recommendation, but believe the installation should be required on a retrofit basis.[29]

The Inquiry was advised that the cost of retrofitting a manual start switch for emergency power remote from the generator set is not significant.

Recommendation:

10.12 The Ontario Building Code should be amended to reference CSA C282-1977.

Recommendation:

10.13 Emergency generators which have not successfully passed the initial installation performance tests in CSA C282-1977, or an acceptable manufacturer's installation test should be sub-

ject to a one time test pursuant to the initial installation performance standard in CSA C282-1977.

The proposed amendments to the OBC (Exhibit 130) reference CSA C282-1977. Without this reference, the OBC does not contain any detailed specifications for emergency generators installed in highrise buildings.

The OFC provides that emergency power systems "shall be 'inspected, tested, and maintained' in conformance with CSA C282-1977 — Electrical Power Supply for Buildings."[30]

The operation and maintenance provisions of CSA C282-1977 are found in Section 8 and include a requirement that:

> "A periodic test of system operations shall:
> a) simulate a failure of the normal supply;
> b) be arranged so that:
>   (i) an engine generator set operates under at least *50% of the rated load* for 30 minutes; and
>   (ii) all automatic transfer switches are operated under load." (italics added)

The initial installation performance tests are found in Section 9 and include a requirement that the emergency generator set:

> "shall be operated at full rated kilowatt resistive load for 4 hours followed by 1 hour at *110% full kilowatt resistive load* to demonstrate its performance capability. . ." (italics added)

If the generator set has never been tested in accordance with this initial test or a similar manufacturer's standard which ensures the equipment will run at *full load*, the acceptance of a periodic test at 50% of the rated load (as required by the OFC) is really no assurance that the equipment will perform its intended function in an emergency situation.

Recommendation:

10.14 Article 6.7.1.3 of the Ontario Fire Code should be amended to clearly require that the written record specified in CSA C282-1977 be maintained.

Article 6.7.1.3 of the OFC deals with emergency power systems. It requires the owner of a building to:

> maintain a written record of inspection, performance, test periods and repairs as required in CSA C282-1977.

During the Inquiry, it became apparent that this Section was in need of amendment. CSA C282-1977 specifies a number of inspections, performance, test periods and repairs, and it is unclear whether the OFC requires a written record to be kept of all *those* matters, or whether a record is to be kept only where the standard requires a written record. The section could be interpreted in either fashion. According to Roy Philippe, the latter interpretation reflects the intention of the drafters of the Article.[31] The Article could be reworded to read:

> Notwithstanding the requirements of Subsection 1.1.2, a written record shall be maintained as required in CSA C282-1977.

The retrofit costing for emergency power done by the apartment industry involved the installation of an emergency generator at a cost of approximately

$75,000.00. The Inquiry was advised that an emergency generator of this capacity, and with this projected cost, is only necessary where emergency power is provided to the elevator system. Because of the cost factor, I have refrained from recommending that emergency power be provided to elevators. I have done so with some reluctance because I recognize that firefighters rely on the elevator, and in some cases the elevator may be used to evacuate the handicapped.

Recommendations about the retrofitting of elevators relating to matters other than emergency power are contained in Chapter 8.

Sprinklers:

Recommendation:

10.15 Sprinklers should be installed in all underground portions of highrise residential buildings, including the underground parking areas.

The underground portions of highrise residential buildings are usually used for storage and can contain parking space. The fire load in these areas is usually great, and the possibility of fires going undetected for a considerable length of time is greater than in other areas of the building. Unoccupied areas are also more prone to arson. All of this is significant because these areas are located below sleeping occupancies.[32] In addition, firefighting below ground in unvented areas is also extremely hazardous to firefighters.

The Inquiry heard considerable evidence about the cost of retrofitting an entire apartment building with sprinklers. It is impossible to extrapolate from those figures the cost of sprinklers for the areas mentioned in this recommendation.[33]

There was extensive evidence regarding the cost of retrofitting sprinklers in highrise buildings, with the most detailed calculations being presented for apartment buildings. The preparation of specifications for sprinkler work, and the cost estimates for that work done by the apartment industry, the Canadian Automatic Sprinkler Association, and the City of Toronto were most helpful in dealing with this very controversial subject.

Even though I have not recommended sprinklers be installed on a retrofit basis in all areas of highrise buildings, I believe the interest in this issue requires an outline of the evidence regarding costs submitted by those for and against the retrofitting of sprinklers.

The apartment industry estimated the cost of retrofitting sprinklers to be $3,504.00 per suite for the Pharmacy Avenue property, and $4,335.00 per suite for the Kingston Road property.

The Canadian Automatic Sprinkler Association costed the retrofitting of sprinklers in the Pharmacy Avenue property at $570,000.00, or $2,036.00 per suite. In cross-examination, Mr. Miller, a witness called on behalf of the sprinkler industry, admitted the cost could go as high as $750,000.00, or $2,679.00 per suite.[34]

The cost figures submitted by the Canadian Automatic Sprinkler Association are, in my view, more reliable than those submitted by the apartment industry for a number of reasons. First, the apartment industry used a "pipe schedule method" and the Canadian Automatic Sprinkler Association used "hydraulic design". The method used by the apartment industry is both outdated and more expensive than the more commonly used "hydraulic design" employed by the sprinkler industry. Second, the Canadian Automatic Sprinkler Association used as-built prices from similar retrofit projects, while the apartment industry relied upon an "all-pricer" book used to price various aspects of building construction. In my view, the actual prices paid are more reliable than the more theoretical estimate developed by the apartment industry. Third, the Canadian Automatic Sprinkler Association has had experience retrofitting apartment buildings, and the cost estimate prepared by the apartment industry did not have the benefit of those with a comparable level of expertise.

The lowest cost figure for the retrofitting of sprinklers provided by the Canadian Automatic Sprinkler Association was $2,036.00 per suite. That would require a rental increase of approximately 7.8% based on a current rent of $350.00 per month. In my view, even this cost, which is lower than the cost submitted by the apartment industry, is of such a magnitude that I have not recommended the installation of sprinklers as a mandatory retrofit item.

I should point out that if an older highrise building requires extensive retrofit work, a life safety study which proposes the installation of a sprinkler system, might be acceptable to the Chief Fire Official and, depending on the circumstances, may be a less expensive way of complying with the retrofit requirements.

When considering this issue, it should be noted that the Ontario Association of Fire Chiefs and the Federation of Metro Tenants Associations did not advocate that all highrise apartment buildings be retrofitted with sprinklers. They indicated that such a decision should be made on a building-by-building basis.

In Chapter 7, recent developments regarding fast-acting sprinkler heads and polybutelyne pipe which may affect sprinkler costs are discussed. In my view, the developments relating to these two products should be monitored. If the positive features of these items, as suggested by their proponents, are substantiated, a reassessment of the cost-effectiveness of sprinklers on a retrofit basis should be made.

Smoke Control:

Recommendation:

10.16 If an apartment building does not have balconies and does not otherwise comply with the requirements to control smoke contained in National Building Code Clauses 3.2.6.2(2) (3a) and (4) the corridors of the residential areas should be divided into at least two parts, with no more than one exit stairwell located in any one compartment.

In recent apartment building fires, people have died in the exit stairwells. In hotels, fire deaths have also occurred in exit stairwells.

In fires where smoke migrated into the hall, the elevator shaft has been identified as the prime avenue of smoke migration to other floors. In many cases, both exit stairwells have also become filled with smoke. In my view, if the apartment corridor is divided as set out in this recommendation, there would be a substantially increased possibility of at least one exit stairwell being smoke free. The advantages of this result are obvious.

Where only two compartments are created within the corridor, the elevators should be contained within one compartment. This would limit smoke migration through the elevator shaft to only one side of the building, assuming a typical floor plan and the fire being located on the side of the building containing the elevators.

The creation of three compartments, one of which would contain the elevators, would have even more beneficial results. In that case, the migration of smoke into the elevator shaft, and thereby through it to other floors, would be limited.[35]

The compartments I have referred to could be created by installing smoke barrier doors equipped with hold-open devices. This would allow the doors to be open during normal situations and to close automatically on the sounding of the fire alarm. Consideration would have to be given to the method to be used by handicapped persons to pass through these doors in an emergency.

There is little doubt that smoke barrier doors, properly installed and maintained, are extremely effective in preventing smoke migration. The fire at Sunnybrook Hospital described in Chapter 6 is a prime example.

A further advantage to dividing the corridor into compartments, as suggested in this recommendation, is that it could assist firefighters in attacking an apartment fire. The restriction of smoke movement by such doors might allow the firefighters to stage their attack from the fire floor itself rather than the floor below.

I have not recommended retrofitting of the type of smoke control required by the NBC for new apartment buildings. The evidence suggested that the cost of retrofitting any of the reliable measures identified in Chapter 7 militates against such a recommendation.

As most existing apartment buildings have balconies, I do not believe that this recommendation will affect a great number of buildings. I recognize that the cost of installing smoke barrier doors as recommended has been estimated at $2,500.00 per door.

The proposed amendments to the HFSA require the installation of smoke barrier doors. The manner and location of the installation is in the discretion of the hotel inspector.

OTHER ISSUES:

Retrofit — Ontario Fire Code or Ontario Building Code:

Part 9 of the OFC will eventually contain all of the retrofit requirements related to fire safety. Some suggestion was made during the Inquiry that because retrofit could involve the "work of construction", as defined in the OBC, building officials would necessarily be involved. Some people are of the opinion that this would make it more appropriate for the retrofit legislation to be contained within the OBC, and be enforced by the local building department rather than the fire service.

The fire service has traditionally inspected buildings for fire safety matters, and I believe they are the appropriate body to make retrofit orders.[36] This issue was canvassed by the Advisory Committee on the Ontario Fire Code. The majority report of the Advisory Committee stated:

> "that the fire service of Ontario [should] be responsible for enforcement of the Code at the Municipal level."[37]

It should be noted that the draft code as proposed by the Advisory Committee contained extensive retrofit provisions.

Fire Code Commission and Retrofit Orders:

Recommendation:

10.17 The unproclaimed sections of the Fire Marshals Act giving inspectors the power to make orders requiring compliance with the Fire Code, and giving the persons affected by those orders various rights of appeal, should be proclaimed.

Section 18(2)(e) of the *Fire Marshals Act*, presently unproclaimed, grants to the officials named therein, the power to make orders for "the remedying of any contravention of the fire code."

Section 18b provides for the appointment of a Fire Code Commission, and Sections 18(6) to (13) provide for appeals by persons who consider themselves aggrieved by an order requiring compliance with the Retrofit Code. The person aggrieved has the option of appealing any Order directly to the Fire Code Commission, or at his discretion, having an informal review by the Fire Marshal with a right of appeal from any Order of the Fire Marshal. The portions of Section 18 of the *Fire Marshals Act* referred to have not been proclaimed.

The retrofit regulations filed in April of 1983 (Exhibit 287) which relate to assembly occupancies, and boarding, lodging and rooming houses, give building owners one year to comply with the retrofit requirements. At the expiry of that year, "inspectors" under Section 18 of the *Fire Marshals Act* will need the power to order compliance with the Retrofit Code, and the Fire Code Commission will have to exist to hear applications for extensions of time to comply with retrofit Orders, and to entertain appeals from Orders.

It is therefore apparent that the task of appointing the Fire Code Commission must be dealt with expeditiously. That Commission will need adequate time prior to April of 1984 to determine its procedures, and to organize its administration.

When will it ever end?

Even if all of my recommendations are accepted and implemented, the identification of new problems, and the development of new technology might encourage proposals for even more retrofit measures. Owners must be especially concerned as to whether there will ever be an end to building improvements imposed by building legislation. Put another way, will any owner ever be able to say with certainty that his building provides an adequate level of life safety and that maintenance of existing facilities will be the only thing required.

Section 18(2)(2b) of the *Fire Marshals Act*, as yet unproclaimed, provides that retrofit should not affect any building constructed since December 31, 1975 in compliance with the OBC at the time of construction. Some of the retrofit measures I have recommended, for example, electrically connected smoke alarms and smoke barrier doors in apartment buildings, may apply to buildings constructed in accordance with the Ontario Building Code. If this work is structural in nature, Section 18(2)(2b) would clearly have to be amended to implement this "class" of recommendation. If it is *not* structural in nature, a further issue arises. That is, can an inspector order work which is *not* structural in nature, but which exceeds the requirements of the OBC in effect at the time of construction. If he cannot, the Section will require amendment to permit the implementation of the two recommendations I have referred to. In my view, whether the word "structural" modifies the word "alteration" in section 18(2)(2b) is unclear.

The Province chose to have this Inquiry to examine fire safety in highrise buildings. I am hopeful that when it did so, it considered the possibility that my examination of the subject could lead to recommendations which could change what has heretofore been regarded as an acceptable minimum level of life safety. If I am correct, then they will be willing to amend Section 18(2)(2b) where necessary.

Finally, I repeat my earlier comments as to the safeguards which exist by virtue of the consensus method of preparing retrofit provisions.[38] I have not found in the evidence a reckless disregard for practical and cost effective retrofit. Further, the option of a life safety study provides an adjusting mechanism for any specific retrofit regulation which an owner believes is impossible to implement.

Until the OFC contains the retrofit provisions for all occupancies, the retrofitting of buildings will be inconsistent across the Province. This is so because, at the present time, retrofit orders can be made based on the discretion exercised pursuant to Section 18(2) of the *Fire Marshals Act*, and owners are subject to local retrofit by-laws. As discussed in Chapter 2, this situation can have undesirable results. Building owners should be subject to only one uniform Retrofit Code. My recommendations, and the work of the Retrofit Task Group, should therefore be proceeded with expeditiously.

RETROFIT LEGISLATION (OTHER JURISDICTIONS):

The Inquiry examined retrofit legislation passed in New York City and in the State of Nevada as it applies to highrise buildings.

The retrofit provisions in New York City are contained in Local Law #5 — Fire Safety Requirements and Controls. That Law was approved on January 18, 1973 and provides for the retrofitting of buildings *occupied for business*, with special provisions for those buildings 100 feet or more in height.

It has extensive provisions related to egress. They include requirements for signs at elevator landings instructing occupants "in case of fire, [to] use stairs unless otherwise instructed", floor numbering signs on the inside of stairwell doors, stair and elevator identification signs, and stair reentry signs where stairwell doors are locked from the inside.

In terms of containment of fire and smoke, Local Law 5 contains retrofit requirements which mandate sprinklers. Sprinklers are not required where fire compartments are provided which do not exceed 7500 square feet. The fire compartment can be larger and remain unsprinklered if other detection devices are provided.

There are also provisions which require smoke shafts for venting smoke and heat to the outdoors or, in lieu thereof, pressurized stairwells. If the building is sprinklered throughout, it is exempt from the smoke shaft and stair pressurization requirements.

In relation to detection, there are retrofit provisions related to fire alarm systems. Fire alarm systems must include voice communication, direct connection to the fire department, products of combustion detecting devices at elevator landings, and detectors in air handling systems. The installation of sprinklers is accepted in lieu of some of these requirements.

In terms of suppression, there are provisions requiring the availability of elevators for firefighters in emergency situations.

In some cases, when the authority having jurisdiction believes that a requirement to provide a retrofit item will cause "practical difficulties or hardships" in a specific case, it may modify the retrofit requirement and either accept existing installations or alternatives which accomplish the intended purpose. This appears to be similar to the provisions for life safety studies in Part 9 of the OFC.

Local Law 5 was the subject of a constitutional challenge in the courts, and therefore did not come into effect until the late 1970's.

Following the MGM Grand Hotel fire, the State of Nevada created the Governor's Commission on Fire Safety Codes. That Commission reported on March 11, 1981, and subsequently Nevada passed extensive retrofit legislation which applies to both lowrise and highrise buildings.

Although some of the following provisions apply to apartments, hotels, or office buildings less than 55′ in height, with the exceptions noted all apply to apartments, hotels, and offices which are greater than 55′ in height.

Containment:

1. Open stairwells and vertical shafts must be enclosed.
2. Every door to an exit corridor which serves 30 or more occupants must be equipped with a self-closing device.
3. HVAC Systems must be equipped with an automatic shut-down device to operate in fire situations.
4. In apartments and hotels only, openings used to supply air between the corridors and hotel suites or dwelling units must be sealed unless:
   a) The corridor contains smoke detectors;
   b) Activation of any two detectors causes the supply of air to cease and seals the opening between the room and the corridor, and;
   c) Approval is received from the authority having jurisdiction to supply air in this manner.

Detection:

1. All of the buildings must be equipped with a fire alarm system.
2. In hotels, a smoke detector is required in each room primarily used for sleeping; and in apartment buildings, one smoke detector per dwelling unit is required.

Suppression:

1. Each exit corridor must be sprinklered.
2. Except in condominiums, each room must be equipped with at least one fire sprinkler above each door opening into an exit corridor.
3. Each elevator must be equipped with automatic recall devices to return elevators to the first floor or, if necessary, to any other floor of the building not affected by fire.
4. In buildings or portions of buildings used for public assembly,
   a) If the building is greater than 12,000 square feet, areas greater than 5,000 square feet must be sprinklered;
   b) If the room is certified for occupancy by more than 300 persons, it must be sprinklered and certain standards for interior finishes must be satisfied.
   Churches and certain other organizations are exempted.

Egress:

1. There is a general requirement that all buildings have adequate exit facilities.
2. Emergency lighting must be provided in every exit corridor and other means of exit.
3. The number of each floor must be posted in every exit stairwell and in every lobby adjacent to an elevator.
4. Except in a condominium, in each room used for sleeping, an explanation of the route to use for evacuation of the building must be posted in a prominent location.
5. Except in a condominum, *in each room* primarily used for sleeping, a paging alarm system must be installed to permit vocal warnings and instructions to occupants. In condominiums the paging alarm is required in the common areas only.
6. The construction of a facility for, or the permitting of helicopters to land on top of buildings, is prohibited unless the authority having jurisdiction approves.

The Nevada Law also provides for a Board of Safety which has powers similar to the Fire Code Commission for hearing applications for variances. It also contains time limits for compliance with the retrofit provisions.

The City of Vancouver fire by-law (No. 2913) provides that the Fire Chief can, in his discretion, require the installation of an automatic sprinkler system where he believes it is needed for the safety of the building occupants. The Inquiry was advised by the Canadian Automatic Sprinkler Association that Vancouver's Fire Chief has exercised this discretion and has ordered the retrofitting of sprinklers in a number of buildings.

[1] Exhibits 287 and 289.

[2] See Chapter 2, Recommendation 2.15.

[3] Transcript, Volume 52, pp. 71 to 72.

[4] Exhibit 235, pp. 21 to 23; Transcript, Volume 52, p. 65. Note that Mr. Boehmer also discussed the need for fire safety plans.

[5] Exhibit 34.

[6] See also Chapter 1 for statistics, and Chapter 3 for general information about apartment buildings.

[7] Exhibit 185, pp. 29 to 31.

[8] Exhibit 220, pp. 1 to 3.

[9] Exhibit 223 attachment.

[10] Exhibits 215 and 303.

[11] Transcript, Volume 48, p. 126.

[12] Transcript, Volume 58, pp. 46 to 47.

[13] Transcript, Volume 30, p. 141.

[14] Exhibit 159, Statistics for 1981.

[15] George Fleming, Transcript, Volume 60, pp. 32 to 33.

[16] Exhibit 56, Regulation Section 56.

[17] Transcript, Volume 33, pp. 124 to 125; Transcript, Volume 34, p. 53.

[18] Transcript, Volume 40, p. 59, see also Chapters 7 and 13.

[19] Evidence of George Coleman, Transcript, Volume 31, pp. 71 to 73.

[20] Exhibit 273.

[21] OBC Subclause 3.2.6.9(1)(a)(i).

[22] OBC Clause 3.2.6.11(1)(a).

[23] Exhibit 223, pp. 14 to 15 (Pharmacy Avenue property)

[24] Transcript, Volume 53, pp. 57 to 59.

[25] Exhibit 289.

[26] Transcript, Volume 61, p. 78.

[27] Exhibit 235, p. 21.

[28] CSA C282-1977, Section 4.2, Exhibit 29.

[29] For correspondence between Mr. Nathwani and the Secretary of the Technical Committee CSA C282, see Exhibit 303.

[30] OFC Sentence 6.7.1.1(1).

[31] Transcript, Volume 61, p. 70.

[32] Support for this recommendation is found in the evidence of George Tamura, Transcript, Volume 15, p. 85.

[33] Reference to new developments in relation to sprinklers and their possible effect on costs are discussed in Chapter 7.

[34] Transcript, Volume 56, p. 11 and p. 17.

[35] Support for this concept appears in Brief 1 by J.H. McGuire.

[36] Further discussion regarding fire service and enforcement is found in Chapter 12.

[37] Report of the Advisory Committee on the Ontario Fire Code, Recommendation 3, page iii.

[38] Exhibit 287.

Chapter 11

Building Contents, Smoking Materials and Fire Retardants

BUILDING CONTENTS

Building contents and smoking materials are a devastating, dangerous and life-threatening combination. Most fires are started by smoking materials. Once the fire starts, the building contents provide fuel. Because of the synthetic materials now used, the fire can release heat faster than when natural products burn, with temperatures in the fire area reaching 1,000 to 1,500°F. A fire involving furnishings made of synthetic materials produces smoke, which has been called the "new smoke". Not only does it contain deadly carbon monoxide, but there can be fatal quantities of hydrogen cyanide and hydrogen chloride.[1] The new smoke can also contain excessive quantitites of carbon dioxide.[2]

Attempts to solve this problem through the development of performance standards for furniture, self-extinguishing cigarettes to counter the careless use of smoking materials, and the use of fire retardant chemicals were reviewed by the Inquiry. That review has led to the following recommendations.

Recommendation:

11.1 Research into the means of regulating the flammability of upholstered furniture should be intensified and the resources necessary for this work should be made available.

Smoke and toxic gases pose the greatest threat to occupants in highrise fires. It has been suggested that 70-80% of fire fatalities in the United States are the result of the inhalation of smoke and toxic gases (Exhibit 216(d)).

In comparison to furniture made of natural products, the introduction of synthetic materials in furniture construction has changed both the rate at which heat, smoke and toxic gases are created, and the nature of the toxic gases. Materials used for interior finishes have had a similar effect on the risks of fire. The fire at 88 Bloor Street East described in Chapter 3, and the MGM Grand Hotel fire in Chapter 4, are illustrations of the effect that these relatively new products can have on life safety.

There was a consensus that the flammability of furniture has to be regulated in some fashion; and that such regulation has to be on a federal if not on an international basis. The reason for attacking the problem at that level is that the furniture market is international and any regulation of it will, by necessity, affect inter-provincial or international trade.

It is my view that finding a solution to the problem of this "new smoke" is of paramount importance. The building codes and fire codes are continuously under review and periodically upgraded to provide increased life safety within buildings. The occupants, however, then bring into the buildings, furnishings which for fire safety purposes, are not regulated in any meaningful fashion.

I was encouraged by the work presently being done by the Flammability Hazards Division of the Department of Consumer and Corporate Affairs (Ottawa) relating to this issue. Dr. Richard Viau, Chief of the Flammability Hazards Division, testified that his Division is presently working on a performance standard for upholstered furniture which will be similar to the performance standard recently developed for mattresses (Exhibit 137). Dr. Viau, who has been working in the area of regulating hazardous products for many years, indicated that the development of a performance standard for upholstered furniture is the most difficult and complex matter he has encountered.

I must caution that the development of a performance standard regarding the flammability of furniture will not provide an instant cure for these problems. Dr. Viau estimated that it might be five years before satisfactory performance standards could be developed. In addition, having regard to the normal life of furniture presently on the market and the practice of re-upholstering old furniture, Dr. Viau estimated that it would be fifteen or more years before any beneficial result would be seen by reason of a performance standard being implemented. The Inquiry was advised that Underwriters' Laboratories of Canada (ULC) is also involved in the investigation of a standard for upholstered furniture.

The standard being developed by the Flammability Hazards Division is one which will result in the total piece of furniture being tested as a unit. In the United States, the furniture manufacturing industry has developed a "component testing" system for upholstered furniture. This system tests the components of the furniture separately, and if each separate part passes a particular test, the final product (complete pieces of furniture) is acceptable.[3] The Flammability Hazards Division believes that a performance standard which allows for the testing of furnishings as a complete unit would be more reliable than the component tests. Dr. Viau explained that the configuration of the finished piece of furniture has such a strong impact that in 75% of the tests conducted, performance of the complete piece of furniture was not predicted by the performance of its components.

In the City of Boston, an attempt has been made to regulate the contents of buildings. A permit must be obtained for the use of decorations, furnishings and interior finishes in every mercantile, business, assembly, institutional and hotel occupancy. The proposed contents of a building must be evaluated before a permit will be issued. With specific reference to upholstered furniture, the evaluation can be conducted on a "component" or "unit" basis. Certain products are identified in Boston's regulations as having acceptable performance characteristics. Applicants must submit information to the Fire Department, including test reports from independent laboratories and sample materials to be tested by the Fire Department Chemist.[4]

During the Inquiry, the question arose as to whether upholstered furniture could be regulated based on the amount and type of toxic gases that would be produced by such furniture in a fire. The evidence of Dr. Viau and others (Exhibit 216(c)) indicated to me that we are not yet at a stage where there is sufficient technical data upon which to reliably impose or enforce toxic criteria as a means of regulating these furnishings.

Two relatively recent incidents indicate that the problem of flammability and toxicity of furnishings have an impact in areas other than highrise buildings. In a recent fire in Cincinnati, involving an Air Canada aircraft, the flammability of the interior finishes and furnishings were identified as major contributing factors to loss of life. In addition, a significant financial loss was suffered due to a fire in a subway station in Toronto in 1976. Although the composition of the seats in the involved subway cars was different from most upholstered furnishings, the nature of the seating material was identified as a major contributor to the magnitude of the loss. The Toronto Transit Commission dealt with this problem by retrofitting all of the seats in its subway cars by applying chloroprene rubber which is commercially known as Neoprene.

SMOKING MATERIALS/SELF-EXTINGUISHING CIGARETTES:

In Ontario, in highrise hotels and apartment buildings between 1976 and 1981, 62.1% of the fires which resulted in deaths were caused by smoking materials, and smoking materials were the source of ignition in approximately 35-40% of all fires.[5]

In OHC highrise apartment buildings between 1976 and 1981, there were six fire-related deaths and all were attributed to careless smoking in bed.

It appears from these statistics that the Ontario record of fires caused by smoking materials is substantially worse than international averages as recorded by the World Health Organization.[6]

These statistics illustrate the urgent need to educate the public that carelessness with smoking materials constitutes an extreme fire hazard. It is apparent that the proper care in the use of smoking materials would dramatically improve our fire record.

Other than prohibiting smoking altogether, the reduction in the frequency of smoking materials as the source of ignition could be achieved by either altering the characteristics of tobacco products and the materials which they ignite, or changing human behaviour by reducing carelessness in the use of smoking materials. I believe that the problem should be attacked on both these fronts.

In the discussion of the regulation of building contents I have dealt with the regulation of furniture which is often the material first ignited by the careless use of smoking materials. In this section I will deal with the feasibility of altering the characteristics of cigarettes and the human behaviour of those who carelessly use those cigarettes and other smoking materials.

Recommendation:

11.2 Research into the development of a "self-extinguishing cigarette" should be intensified and the resources necessary for this work should be made available.

The Ontario Association of Fire Chiefs urged the development of a self-extinguishing cigarette. The mere fact that a cigarette will "self-extinguish" is not the sole answer to the problem of cigarettes being a common source of ignition. The time that it takes the cigarette to self-extinguish is the crucial factor.

The variables which can affect the outcome of a lit cigarette being in contact with any material are related to both the combustible characteristics of the cigarette and the flammability of the material with which it is in contact. For example, the combustible characteristics of a cigarette may be dependent on its packing density, porosity and burning rate of the paper, and its diameter and length.

If the burning cigarette is in contact with upholstered furniture, whether the furniture will ignite is dependent on such variables as the type of fabric, design of the fabric, the tension of the fabric, the geometry of the piece of furniture, the cushioning materials and the imponderable factor of the orientation of the cigarette. Mattresses are fairly standard in design, at least as compared with other furnishings, and the problem of ignition in these cases was approached by regulating mattresses rather than by development of a self-extinguishing cigarette.

Having regard to all of these variables, the difficulty in determining the time frame during which a lit cigarette must self-extinguish in order to effectively limit charring and continuing combustion of upholstered furniture is obvious. Tests may indicate that the time period required for self-extinguishment in order to prevent fires is so small that it may be impossible to develop such a cigarette.

Dr. Viau testified that even if a "self-extinguishing cigarette" was developed, tests would be required to ensure that there would be no adverse health effects caused by physical changes to the cigarette. He said that slower burning cigarettes are more likely to go out; but it is believed that slower burning cigarettes create more tar and could increase the health problems associated with smoking.

The attempt to develop a self-extinguishing cigarette is strictly a North American phenomenon, and in Canada, the Flammability Hazards Division of the Hazardous Products Branch (Ottawa) is presently addressing this issue They have completed a study on the various characteristics of cigarettes which affect their combustion behaviour, and the ignitability of mattresses by cigarettes. The next phase in this program is the study of the ignitability of upholstered furniture by cigarettes.

There have been attempts to regulate cigarettes as a source of ignition in the United States at both the federal level (Exhibits 138, 139) and in the State of California. These attempts have been primarily aimed at the development of a self-extinguishing cigarette. None of those attempts have resulted in legislation requiring the study or development of such cigarettes.

Recommendation:

11.3 Education should be directed towards reducing the incidence of the careless use of smoking materials.

Many witnesses and briefs advocated the creation of an offence and the imposition of penalties for the careless use of smoking materials. I foresee both constitutional and enforcement difficulties associated with this proposal. It is my view that if the legal system is to be a means by which this human behaviour is to be modified, the civil courts might be a more appropriate forum.

I believe the major effort to reduce careless smoking should be through an educational process. The main objective should be to make the public more aware of the hazards associated with the careless use of smoking materials. In Chapter 13, I expand on the methods and subjects for public education.

FIRE RETARDANTS

The OBC prescribes flame-spread rating and smoke developed classification for interior finishes (3.2.6.7). The OFC prescribes flame-spread rating for partitions and screens and a standard test for assessing the flame resistance of drapes, curtains and other decorative materials. It also provides that flameproofing treatments must be renewed as often as necessary to ensure that the material will pass prescribed tests for flame-resistant textiles and films (2.3).

A brief was received from the manufacturer/distributor of a fire retardant spray used for the protection of interior textiles and fibrous materials (Brief 8).

The Inquiry also heard evidence from representatives of that company. Their product, PTE 111, is only one of a large number of flame-retardants available for textiles.

A "fire retardant" does not "fire proof" the object to which it has been applied.

> "The object of fire retarding is to reduce the possibility of an incipient fire or flame from spreading and becoming a conflagration. . ."[7]

I was urged to recommend a more intensive use of fire-retardant sprays and adopt a system relating to fire retardants similar to that in place in the State of California. This is a highly technical area. Any final decision would require consideration of technical evidence which was not canvassed by the Inquiry. For that reason, my comment regarding fire-retardants will be general in nature and will perhaps provide some direction to those wishing to consider this topic in more detail.

In considering any fire-retardant, four basic questions arise:

1. How permanent is the retardant material?
2. What impact, if any, does the fire retardant have on the toxicity of combustion gases produced by a fire?
3. Are there any acute toxilogical effects of the retardant? That is, under normal, non-fire use, does contact of the chemical retardant with parts of the human body have any immediate detrimental effect, or is the chemical otherwise toxic?
4. Are there any chronic toxilogical hazards related to the retardant? That is, are there any long-term effects such as carcinogenicity?

The evidence illustrated there is very little information regarding chronic toxological hazards. It is that matter which gives rise to my concern over regarding fire-retardants as a panacea for the problems of flammability and toxicity of furnishings and interior finishes.

The manufacturer of PTE 111 did not satisfy me that its product did not pose any chronic hazards, or that toxic gases would not be produced if the material which had been treated with the flame-retardant was exposed to fire.

In the United States, the Consumer Products Safety Commission conducted a literature review of reported studies about flame-retardants, and concluded that "future use of flame-retardants will depend on a variety of factors, including. . . development of comprehensive toxicity data on existing and new flame-retardant chemicals."[8] This view was echoed by Dr. Viau, the Chief of the Flammability Hazards Division of the Hazardous Products Branch (Ottawa).

Most of the flame-retardants cited in the review conducted by the U.S. Consumer Products Safety Commission had basic toxological data available at the time of commercialization. That toxological data was, however, primarily relating to acute studies. That is, the studies discuss primarily immediate, as distinct from chronic, effects. Data on mutagenicity was stated to be currently available for the flame-retardants studied but "such testing frequently has not been performed in a comprehensive manner or else is insufficiently described in the literature."[9]

The method of enforcing minimum standards for flame spread and smoke development ratings varies from one jurisdiction to another. In Ontario, compliance with prescribed standards is enforced by the testing of samples and materials which are being used in specific buildings. In California, in addition to this type of field testing, the sale and application of chemical flame-retardants is regulated. In California, before a chemical flame retardant can be sold to the public, it must pass tests in accordance with specifications filed with the Office of the Fire Marshal. If the chemical flame-retardant passes those tests, it is registered, and the granting of a registration allows the use of the specific flame-retardant chemical on specified materials. The California law also requires the registration of any business involved in the application of chemical flame- retardants.[10]

Although the State of California does not regulate chemical flame-retardants on the basis of adverse toxological effects, the Inquiry was advised that the California Fire Marshal has been given a mandate by the state legislature to examine the inclusion of toxicity criteria in the regulation of these products.

[1] Attachment to Exhibit 278, (the Report of the Westchase Hilton fire) contains a comment on burning synthetics, and reports that all victims had elevated blood levels of hydrogen cyanide.

[2] Sumi K. *"Toxic Gases and Vapours Produced in Fires"*, National Research Council, December 1971.

[3] Transcript, Volume 25, pp. 21 to 26.

[4] Exhibit 277; Boston Fire Department Regulations Controlling Decorations, Furnishings and Interior Finish, November, 1981.

[5] Exhibits 10 and 11.

[6] Exhibits 11 and 146.

[7] Brief 8, Attachment B, p. 4.

[8] Exhibit 300; *Literature Review: Flame Retardant Chemicals in Textiles*. Clinical Toxicology 17(1) 1980.

[9] Exhibit 300, p. 125.

[10] California, Fire Marshal, *Assessment of Test Methods to Determine Combustability/Toxicity of All Materials*, April, 1983.

Chapter 12

The Fire Service

FIRE DEPARTMENTS:

In the Province of Ontario, as is the case generally in North America, municipal fire departments have developed in response to specific perceived needs of particular people living in fairly small, defined areas. When our population was predominantly rural or lived in small towns, persons relied on the goodwill of their neighbours for the suppression of individual fires. While some expertise was probably developed from experience, there was little need or opportunity to become familiar with sophisticated techniques of fire suppression. As the needs in specific areas became more complex, some individuals in the community became more knowledgeable and interested in fire suppression. Such a group would form the nucleus of the volunteer fire department. These people would attempt to learn a little more about suppression and organize themselves and other members of the community in order to respond more effectively to fire emergencies.

Major trends which increase the need for an organized fire department in a municipality include growth in population and size, and the introduction of buildings that pose a high risk to life and property. For example, schools, factories, hospitals and eventually, highrise buildings pose problems in fire suppression that require a more organized approach than in communities of primarily single-family dwellings. As these needs increase, volunteers become more sophisticated and eventually some municipalities hire a few full-time firefighters, or at least, a full-time fire chief. These people, together with continuing support from volunteers, make up a composite fire department.

In order to have some full-time firefighters, a decision must be made by the municipality to supply funds for salaries and for the proper equipment. Consideration must also be given to providing the necessary resources to allow training, both of the full-time and of the volunteer firefighters.

The next step would be a decision by municipal council in certain circumstances to fund a full-time fire department. In municipalities where this type of fire department is established more equipment and training would be needed.

Because of this historical development, there is no specific requirement for municipalities to have a fire department. Fire departments are completely the creature of the municipality, and even today, receive no direct Provincial funding. However, should a municipality choose to have a fire department, some aspects of their administration and equipment are regulated by the *Fire Departments Act*.

In Ontario today, three types of fire departments exist. Some municipalities still depend on a totally volunteer or part-time fire department. Others have a composite fire department, a combination of full-time and voluntary firefighters. Finally, generally in larger centres, there are full-time fire departments. Although most highrise buildings tend to be in these larger centres, highrise buildings as defined in the OBC, exist in municipalities which do not have a full-time fire department. For example, in 1981, there were composite fire departments in such places as Barrie, Saint Catherines, Niagara Falls, Mississauga and Brampton.[1]

The adequacy of fire protection services provided in any municipality can only be measured after one has considered what the fire department is expected to do. If the only purpose for having a fire department is to have trained people on hand to perform suppression, then a given complement with sufficient equipment for those activities must be provided. Suppression includes fire extinguishment, protection of adjacent properties and rescue of endangered persons.

Even where suppression is the only activity expected, consideration must be given to the type of fires that could be expected to occur in that municipality. This will be influenced by the presence of buildings such as factories, hospitals or highrise buildings. It is necessary to assess the amount and type of equipment that would be necessary for suppression as well as the number of persons on staff and the level of training required. One must also determine how much staff is necessary at any given time of the day or night and where they should be deployed. Finally, there should be adequately trained personnel to undertake pre-fire planning, that is, planning for fire department response to specific buildings for purposes of suppression and rescue.

In recent years, the functions expected of the fire department have changed. There has been an increasing emphasis on fire prevention as distinct from fire suppression. Activities undertaken by fire departments which promote fire prevention include inspections, education and enforcement of fire safety legislation. I am not to be taken as saying that fire prevention cannot be undertaken by fire departments which are made up totally of volunteers, or by composite fire departments. The real issue is, whether the municipal council has considered the need to provide these services, and whether it has given adequate support to its fire department to allow it to perform them.

A very different assessment of the adequacy of fire protection services is required where the fire department is expected to perform fire prevention in addition to fire suppression. Local fire departments are expected to enforce the Ontario Fire Code. Proper enforcement of the OFC requires the review and acceptance by the local fire department of individual fire safety plans, the giving of advice to building owners in the preparation of fire safety plans, conducting inspections of buildings, making orders requiring compliance with the OFC, and the initiation of prosecutions under the *Fire Marshals Act*. In relation to the inspection function, it is necessary to consider the frequency of inspections for different types of buildings, the number of inspectors that are required in any given area, and the amount and type of training that those inspectors would need.

Another aspect of fire prevention is education. If the fire department is expected to undertake fire prevention education, it must be decided whether this should involve going into local schools and apartment buildings, whether the fire department should publish pamphlets or distribute materials prepared by others, and what sort of training members of the fire service will need in order to effectively educate others.

OFFICE OF THE FIRE MARSHAL:

Coordination of fire safety services in the Province is expected to be done by the Office of the Fire Marshal, part of the Ministry of the Solicitor General.[2] The powers and duties of the Fire Marshal are listed in the *Fire Marshals Act*.[3] They include assisting and advising local municipalities, compilation of fire loss records, investigations of fires, public education, and providing advice and assistance to Ministries and agencies of the Government. The OFM also administers and enforces the OFC and the *Hotel Fire Safety Act*.

Assist and Advise Municipalities:

With regard to the relationship between the OFM and municipalities, the language of the *Fire Marshals Act* is generally permissive, directing him to assist and advise municipalities with regard to the fire service. He cannot direct them how to run their fire departments.

In conformance with the duty to assist and advise, the OFM undertakes fire protection surveys in various municipalities in the Province only when requested to do so by the municipality. The request takes the form of a resolution of the municipal council. John Bateman, the Fire Marshal of Ontario, described the fire protection surveys:

> "We go in and we look at the fire department, we look at the water supplies, the legislation, municipal legislation that is available, the communications, the whole infrastructure and one of the parts of our survey [deals] with the manning of vehicles".[4]

The level of fire protection is in the sole discretion of the municipality. There are no provincial guidelines for any of the matters described above and the municipality is free to accept or reject the advice of the Office of the Fire Marshal.[5] Mr. Bateman discussed the current relationship between the OFM and the local municipalities:

> "We find that we can make the most mileage in enhancing the standard of fire protection in the municipality by working with the municipal council and with the fire chief, and encouraging them to do what they can do best, rather than attempting to dictate."[6]

Mr. Bateman said that if municipalities do not want assistance, he is unable to force them to accept it.

Fire Loss Records:

It is the duty of the Fire Marshal to keep a record of every fire reported to him, together with certain facts, statistics and circumstances.[7] "Assistants to the Fire Marshal" must report all fires occurring in their municipality to the Fire Marshal, if they receive information about the fire. The chief of the municipal fire department is, by virtue of the *Fire Marshals Act*, an assistant to the Fire Marshal. In municipalities that do not have a fire department, the clerk of the municipality becomes an assistant to the Fire Marshal *for these purposes*. Therefore, all fires to which there is a fire department response are reported to the Fire Marshal. As well, fire insurance companies are required to report fire losses on property insured by their company to the Fire Marshal.

Through these systems, most fires in the Province are reported to the OFM and form part of the data that is collected in that Office. The reports acquired by the OFM are fairly detailed and are now collected on computer. It was the opinion of several witnesses at the Inquiry that the information collected in Ontario is highly reliable, and is probably one of the best sources of information about fires in North America.[8]

Fire Investigation:

The OFM undertakes investigations of certain types of fires. These include fires involving fatalities, non-fatal large loss fires, arson fires, and other fires of special interest. Reports are made about these investigations, and the knowledge gained from doing these investigations becomes part of an ongoing educational process which can be reflected in fire prevention techniques and in the development of codes.

This knowledge has an impact on code requirements because persons from the OFM are members of various code committees such as those formed by the Associate Committee on the National Building Code. They also comment upon and assist in drafting provincial legislation, such as the Fire Code and, in particular, the retrofit provisions of that Code. They also advise the Building Code Branch about amendments to the OBC as they relate to fire safety matters.

Education:

The powers and duties of the Fire Marshal with regard to education arise from the *Fire Marshals Act* and from the *Fire Departments Act*.

Fire Marshals Act

> 3. Subject to the regulations and for the prevention and investigation of fire, it is the duty of the Fire Marshal and he has power,
>   (d) to disseminate information and advice as to the prevention of fire by means of public meetings, newspaper articles, pamphlets, exhibitions and moving picture films and otherwise as he considered advisable.

Fire Departments Act

> 13. The Fire Marshal may,
>   (a) establish, maintain and operate a central fire college for the training of fire department officers;
>   (b) establish and operate regional fire schools for the training of fire fighters;
>   (c) provide travelling instructors for fire fighters,
>
>   and the cost thereof is payable out of the moneys appropriated therefor by the Legislature.

The OFM maintains a library which is available for research in fire safety matters. There is also a film library. The films are made available for purposes of public education. Mr. Bateman advised that, while he would like to be able to produce films, he does not have the funds to do so.

The OFM has recently prepared guidelines for owners of buildings to use when preparing fire safety plans required by the Ontario Fire Code.[9]

For the assistance of local fire departments, the OFM is preparing guidelines for their use when enforcing the Ontario Fire Code. These guidelines will take the form of an inspection manual.[10]

Finally, and perhaps most important, the OFM can also offer training for officers of local fire departments, should the municipality choose to take advantage of that training.

The power to offer training to officers at a central fire college is granted to the Fire Marshal in the *Fire Departments Act*.[11] The OFM is involved in designing training programs and conducting courses at the Ontario Fire College in Gravenhurst. There are further comments about the Fire College in this Chapter under the heading, "Training for Fire Service".

The OFM can also offer training for firefighters either in regional fire schools or at the local level.

Consulting Services:

Some plans review is done in the OFM by the Consulting Services Unit. This Unit examines plans for buildings funded by the Government of Ontario such as nursing homes, hospitals, schools, and homes for the aged. This is done pursuant to the responsibility of the OFM to advise Ministries and agencies of the Government, and also pursuant to other specific legislation which requires the OFM to examine plans for such buildings as public hospitals.

The Consulting Services Unit also examines plans for the renovation or construction of hotels. The plans are examined for compliance with the HFSA, and advice is given with regard to fire safety matters. This is done because the OFM is responsible for the administration and enforcement of the *Hotel Fire Safety Act*.

This Unit carries out the responsibilities of the OFM for the administration and enforcement of the Ontario Fire Code.

Finally, the Consulting Services Unit also provides general consulting advisory services to those who request it. For example, where someone is installing a central data processing unit and wishes advice as to proper fire safety, they can get that advice from the Consulting Services Unit of the Office of the Fire Marshal.

Hotel Fire Safety:

The OFM is responsible for the administration and enforcement of the *Hotel Fire Safety Act*. Plans review is undertaken by the Consulting Services Unit, and the Hotel Fire Safety Services Unit is involved primarily with inspection.

The broad range of services undertaken by the Office of the Fire Marshal described above are provided by a staff which includes approximately 40 persons who have had prior firefighting experience, former members of the Ontario Provincial Police who are involved in investigations, about 75 inspectors for the *Hotel Fire Safety Act*, and a number of professional engineers. The engineers usually have fire related experience and, if possible, expertise in more than one field. The staff in the OFM also receives on-the-job training.

Recommendation:

12.1 The Province of Ontario should increase funding to the Office of the Fire Marshal to provide for additional staff, to increase its activities in education both for the public and for the fire service, and to increase its ability to investigate non-fatal, large loss fires, arson fires, and other fires of special interest.

Section 3(i) of the *Fire Marshals Act* allows the Fire Marshal, on the instructions of the Solicitor General, to make certain investigations. Mr. Baird suggested that this power should be used to investigate non-fatal fires which are of special interest. I was advised by the Fire Marshal that these powers have not been used frequently. However, he testified that in relation to non-fatal and suspected arson fires:

> "...I would like to be able to do more [engineering or technical investigations] on those levels, and not necessarily on just the tragedies. I feel that we might be able to learn as much from a $50,000.00 fire loss in a large building, or under unusual circumstances, as we would from a multi-fatality fire."[12]

The Fire Marshal expressed specific concern about his need for additional staff to be involved in the investigation of fires, particularly those caused by arson. He wishes to provide more engineering support for his own office and for local fire departments. He wishes to spend more time publicizing the OFC through seminars for fire departments. I also comment that it would be very beneficial if the OFM could provide direction or guidelines for *OBC inspectors*.

As I perceive it, most of the criticisms of the OFM heard by this Inquiry arise directly from the lack of resources provided to that Office. At the present time, the budget of the OFM is approximately 3 million dollars per year. Approximately 3 to 5 per cent of that amount is available to fulfill the duty to provide information and advice about fire protection to the public-at-large. I have made recommendations regarding the urgent need for additional public education, and for the education of building superintendents. I have recommended that the education be coordinated through the Office of the Fire Marshal. I am sure increased funding will be required.

While Mr. Bateman commented that the OFM in Ontario has had better support than similar offices in other Provinces, there was general agreement among other members of the Fire Service that the OFM is not given a position of high priority in the Province.[13] My impression of the evidence was that either a request for additional funding to fulfill his obligations has not been made, or if made, the request has not received the necessary political support.

ADEQUATE FIRE PROTECTION:

Recommendation:

12.2 There should be adequate fire protection for the citizens of Ontario commensurate with the needs of each municipality.

No one can deny that adequate fire protection should exist. The method of implementation is the difficult issue. The *need* for adequate fire protection and the *methods* of implementation have been discussed by the fire service and various levels of government. These issues are ones that are not typically discussed by the general public. The reason for this is that the fire department is taken for granted and it is not generally recognized that its existence is permissive.

Although I will not make any recommendations regarding the methods of implementing adequate fire protection, I believe that it is incumbent upon me to deal with the threshold question — should each municipality be required to provide some fire protection to its citizens? Putting the question another way, should fire protection be a "right" of the citizens of Ontario in the same way that police protection or health care is presently regarded as a "right"?

Representatives of the three main segments of the fire service — the firefighters, fire chiefs and the Fire Marshal — were unanimously in favour of a provincial law which would require all municipalities to provide an adequate level of fire protection to its citizens.

The brief submitted by the Ontario Professional Fire Fighters Association states:

> "The matter of adequate fire protection in this Province has been an area of concern of the Ontario Professional Fire Fighters Association for many years and it is a matter that MUST be dealt with by the Fire Marshal's branch of the Solicitor General's department. . .We urge this inquiry to act to the full extent of its authority to initiate a complete study of. . .ADEQUATE FIRE PROTECTION in this Province."[14]

A brief submitted by the Ontario Association of Fire Chiefs to the Solicitor General during the review of the *Fire Departments Act* referred to the *Police Act* which states:

> 2.-(1) Every city and town is responsible for the policing and the maintenance of law and order in a municipality, and for providing and maintaining an adequate police force in accordance with the police needs of the municipality.

That brief commented:

> "There is nothing in the *Fire Departments Act* similar to the requirement for the *Police Act* that the municipality maintain an adequate level of fire protection service. [For] obvious public policy reasons that dictate the statutory requirement under the *Police Act*, we recommend that a similar provision be included in the *Fire Departments Act*."[15]

John Bateman testified:

> "In principle, I am in favour of mandatory fire protection, I feel that it is right in the same category as police protection or health care is a right, that should be afforded to the citizens of Ontario."[16]

John Bateman testified that approximately 98% of the population of Ontario has fire protection. I understood him to be referring to suppression only.

The need for a requirement in Provincial legislation for adequate fire protection was discussed during the hearings of the Standing Committee on the Administration of Justice when it was considering the Ontario Fire Code. The Honourable R. Roy McMurtry, then Solicitor General, made the following comment:

> ". . .we are seriously considering recommending amendments to municipal legislation requiring municipalities to maintain a fire department. . . .
>
> As you know, there are such provisions in relation to policing, and we think perhaps the time has come to provide for some mandatory legislation with respect to fire departments as well. But there will be very small municipalities that will continue, I assume, even if there is such legislation, to maintain some sort of voluntary fire department, but I am not too sure what they would do. With respect to policing, it depends on the size. . .all cities and towns must maintain a police force. We think it

> would not be unreasonable to make a similar provision for fire departments."[17]

Adequate fire protection is not limited to fire suppression. Mr. Donal Baird and Chief Ben Bonser testified that fire prevention is becoming increasingly important, and there is a need to consider *fire prevention* when determining whether a municipality has adequate fire protection. Enforcement of the OFC is *fire prevention*.

The *Fire Marshals Act* gives to the Fire Marshal the power to inspect existing buildings and to make orders. Further, the Fire Marshal may prosecute persons who contravene the FMA or the regulations, which now include the Fire Code. In practice, these powers are exercised by local fire department personnel in their capacity as inspectors or assistants to the Fire Marshal.

Although the obligation to comply with the OFC falls upon the building owners, the evidence clearly demonstrated that strict enforcement of that code by well informed and trained inspectors is required. The level of training required for inspectors will vary depending on the fire risks existing in the specific municipality. Without a mandatory requirement for adequate fire protection there is no mechanism by which the Fire Marshal can ensure the OFC is being complied with across the Province.

With the exception of pre-fire planning, there was little evidence of inadequate response to fires by suppression forces. On the other hand, however, there was evidence of a need to improve fire prevention generally, and particularly, inspection by public and private agencies. For example, Assistant Deputy Chief Sproule could not advise the Inquiry when the last complete inspection was made prior to the fire at 800 Richmond Street West.[18] The investigation after that fire revealed breaches of the OFC, many of which would have been patently obvious on a properly conducted fire inspection.

There was a suggestion during the Inquiry that if provincial legislation imposed a requirement to provide adequate fire protection on municipalities, there could be a reduction, or a total loss of, the volunteer fire service which serves a great number of people in Ontario. In my view, this need not be the case. I accept the evidence of Chief Wretham and Chief Gibson in this regard. Chief Wretham testified:

> "I would stress that it[adequate fire protection] doesn't have to be a full-time department. Manning could be done with volunteers."[19]

He was stressing that the implementation of the principle of adequate fire protection would not require every municipality, regardless of its size or location, to provide the same type of fire department as larger centres. This answers what I understand to be the concern of those who have, in the past, opposed "mandatory fire service".

The Inquiry did not conduct a comprehensive analysis of the fire protection services presently being provided in specific municipalities. An assessment of the needs of any particular municipality might very well demonstrate that an adequate level of fire protection can be provided by the present fire service.

John Bateman alluded to a number of difficulties that could be encountered if adequate fire protection became mandatory. For example, consideration would have to be given to the need to regulate things such as the ratio of fire department manpower to the population, the level of risk in the occupancies that would have to be protected, the amount and source of additional funding, the degree to which volunteers would be considered as acceptable staff for fire departments, and the manning levels of different vehicles. In unorganized municipalities certain elements of adequate fire protection would have to be provided by the Province. All of these difficulties relate to implementation of the principle of adequate fire protection. Those difficulties were not canvassed in detail by this Inquiry, and in my opinion, are a proper subject matter for a special task group.

The Inquiry was advised that the *Fire Departments Act* is presently being reviewed by a Task Group under the chairmanship of Mr. Frank Wilson, Assistant Deputy Solicitor General. In my view, that Task Group would be an appropriate body to consider how to overcome any practical difficulties with this recommendation, including how the adequate level of protection for any municipality should be determined.

Mr. Ronald Bowman, executive vice president of the Ontario Professional Fire Fighters Association is a member of this Task Group. He testified about the work of that Group:

> "We have reached a consensus on the matter of adequate fire protection. We believe that there should be some wording in the [Fire Departments] Act. We haven't come up with any ideal wording or any catch-all wording or any formula for stating. . .that X-ville should have so many firefighters, but we have addressed the problem, we have agreed that it is a problem, and we are still working toward that end."[20]

In Mr. Bowman's opinion the practical difficulties which have to be dealt with in implementing the principle of adequate fire protection were matters properly dealt with by this Task Group. I agree.

THE FIRE SERVICE:

Staffing of Fire Departments:

When a municipal council addresses itself to the question of adequate staff levels of the local fire department, they must examine the needs of the municipality for suppression, prevention and code enforcement.

The brief submitted by the Ontario Professional Fire Fighters Association (OPFFA) states:

> "The matter of adequate fire protection in this Province has been an area of concern of the Ontario Professional Fire Fighters Association for many years, and is a matter which must be dealt with by the Fire Marshal's Branch of the Solicitor General's department. This Inquiry would be appalled if it was aware of the many cases of inadequate manning that exist in this Province, in municipalities with highrise buildings, hospitals, nursing homes and other high risk situations.
>
> We urge this Inquiry to act to the full extent of its authority to initiate a complete study of Adequate Manning and Adequate Fire Protection in this Province."[21]

I understand the term "full manning", as used by the OPFFA and firefighters who appeared before the Inquiry, to mean a requirement for enough firefighters on duty at any given time to fully man and operate *every* piece of fire apparatus owned by the fire department.[22]

With regard to the matter of suppression, the Fire Marshal explained that one of the matters dealt with in his fire protection survey is the "manning of vehicles". In this portion of the survey, the OFM advises the municipality of the optimum number of persons needed in order to efficiently use each piece of equipment. For example, for a triple combination fire truck, the OFM might recommend that five firefighters are required to effectively operate that equipment at the fire scene. If a fire department had five such vehicles, the simple application of the guidelines used by the OFM would lead to a recommendation that the fire department needed 25 firefighters on duty at all times to operate the triple combination fire trucks.

John Bateman advised that the numbers used by his Office are derived from a handbook published by the National Fire Protection Association and from various insurance advisory organizations, based on their assessment of the response capability required to effectively respond to a low hazard fire, such as a single family dwelling. Consideration of high risk fires such as fires in industrial complexes or highrise buildings is apparently not a factor in recommending these numbers.

In determining the number of firefighters that should be on duty at all times, application of the "simple table" which merely multiplies the number of vehicles the fire department has by the number of men required to operate each vehicle does not identify the required level of staffing. To determine the level of fire department staffing, one must consider the history of fire in the community and the size of responses which have been necessary, and the anticipated need to protect adjacent properties and rescue endangered persons. Consideration of the type of buildings and fire hazards which exist within the municipality is also necessary.

In the past, it has been the practice in most fire departments to have a relatively small number of persons trained to undertake the various aspects of fire *prevention*. Even in very large fire departments, there are only a handful of fire prevention officers, and these officers are expected to undertake inspection and education. The Inquiry was advised by Chief Ben Bonser, Fire Chief of the City of Toronto, that the trend now is away from the traditional separation of the suppression forces from the fire prevention bureau. In the City of Toronto, the fire prevention forces are being expanded by giving persons who are ordinarily employed in fire suppression some training in various aspects of fire prevention. This training will allow more staff to be involved in inspections and education, and will result in a more efficient use of suppression personnel.

As inspection and education become more important, and the duties of persons undertaking inspection and education become more complex, it will be necessary to examine whether the inspection and education forces in the fire service require the involvement of professional engineers and educators. I comment further on this matter below, in the section on training for the fire service.

Pre-Fire Planning:

Recommendation:

12.3 The Office of the Fire Marshal should develop a guideline for the assistance of fire departments in preparation of pre-fire plans.

Recommendation:

12.4 Fire departments should develop pre-fire plans for all highrise buildings.

One of the most important tools used by the fire service in combating fires is the fire department response plan, or pre-fire plan.

Members of the Scarborough and Ottawa Fire Departments explained that persons involved in fire suppression are expected to visit buildings to which they might ultimately be required to respond. They familiarize themselves with the physical layout of these buildings, specific hazards, and the equipment that would be available for their use in the event of a fire.

The actual "pre-fire plan" is a more formal document. This plan should describe the type of construction, the kinds of internal fire protection in existence, the location of utility shut-offs, the identity of personnel who would be expected to be on duty, the uses of the building, the location of the siamese connection, and, in some cases, the location of certain occupants. The location of occupants is most important in institutional buildings such as hospitals, where it might be necessary to be aware of the location of operating rooms or intensive care facilities. The pre-fire plan should also include sketches which show access routes or other particular features of the property.

At the present time, instruction is given at the Ontario Fire College regarding the preparation of pre-fire plans. It is also my understanding that pre-fire plans are the subject of instruction at regional fire schools conducted by the Office of the Fire Marshal.

The evidence of the large full-time fire departments was that pre-fire planning is presently taking place, and is ordinarily done on a priority basis. Their first priorities are hospitals, hotels, industrial complexes, and eventually highrise buildings. The priorities are affected by specific needs of the municipality.[23] For example, in Toronto, one of the first priorities was to do a complete pre-fire plan for the entire subway system.[24]

One fire chief seemed concerned that the involvement of provincial inspectors from the Hotel Fire Safety Services Unit in local hotels might interfere with his ability to send persons from the fire service into hotels for purposes of pre-fire planning. However, it does not appear to me that the presence of hotel inspectors should in any way interfere with local pre-fire planning. I would be most surprised if the owner of a hotel would object to visits by the local fire department for the purpose of planning fire department response. Further, John Hess, the Chief of the Hotel Fire Safety Services Unit, commented that it was not the intention of his Unit to usurp the role of the fire department in pre-fire planning. He appears more interested in assisting the fire department by supplying them with information that might make pre-fire planning easier.

Many apartment buildings are typical in design. Chief Wretham of Scarborough suggested that, in those buildings, floor plans should be available to the fire department at the time of response. Assistant Deputy Chief Sproule of the City of Toronto commented that the location of persons in need of assistance should be maintained by the owner of the building and should also be available at the time of response. I comment that while both of these suggestions appear reasonable, it will be necessary to advise owners of buildings that this type of information is needed at the time of a fire department response, and should be included in the fire safety plan.[25]

During his discussion about the proper use of voice communication systems Chief Wretham commented that, ordinarily, firefighters are not aware whether a voice communication system exists in any particular building at the time of response. This is something that should be dealt with in the pre-fire plan, so that firefighters will be able to consider the proper use of the system in the particular situation, and to advise building staff of the messages to be transmitted during a fire emergency. In addition, if effect is given to my recommendation that one-way voice communication be installed on a retrofit basis in all highrise buildings over 12 storeys (other than institutional buildings), firefighters will know that voice communication is available and will be able to effectively plan for its use.[26]

Finally, although large full-time fire departments are probably quite able to undertake effective pre-fire planning, guidelines from the Office of the Fire Marshal would be of assistance to them, and more particularly, to smaller composite or volunteer departments.

Computer Aided Dispatch:

One relatively new development in the fire service is the introduction of the computer-aided dispatch system (CADS). For purposes of assisting fire department response, computers can be used in two ways. First, the system can be used to plan initial dispatch to any particular fire, as well as the appropriate follow-up. The system would keep track of the amount and type of equipment available at various fire stations, and the number of staff on duty. Then, when there is a call to a particular property, the system can examine this information along with other factors and choose the most efficient method of responding to that fire.

Second, a computer-aided system can also be used for storage and retrieval of pre-fire plans. In the City of Toronto, these plans are now copied and reduced to microfiche. Eventually, there will be a very large number of these plans, and they will probably be stored more effectively on computer and be readily available at the time of response.

I understand that similar systems are being designed in a number of areas simultaneously. For example, the Chiefs of Scarborough and of Ottawa both described CAD Systems that are being programmed in their municipalities. However, neither one of them appeared to be aware of the work being done in the other municipality. This kind of information can be shared through the Ontario Association of Fire Chiefs. I make further comment about this matter in the section of this Chapter on training for the fire service.

Response Time:

While in the early stages of the Inquiry there appeared to be some criticism by tenants of the failure of the fire department to respond to alarms, on closer examination it became clear that any failure to respond was simply the result of the lack of a call to the fire department. Tenants commented that, once they were called, the fire department could be relied upon to respond, and do so in an efficient manner.

It is a matter of justifiable pride in the fire service that their response time is very short. Chief Gibson of North York said that the average response time for his department is just over 3 minutes. I am satisfied that, at least in the larger fire departments, this holds true throughout the Province.

The maintenance of an efficient response remains a matter of high priority in the fire service, and is the major reason for the introduction of CAD Systems in large fire departments.

Fire Department Communications:

Recommendation:

12.5 The Office of the Fire Marshal should assess the needs of local fire departments for additional radio channels, and should coordinate applications to the Federal Government for allocation of any necessary additional radio channels.

The efficiency of suppression relies on the efficiency of communication during firefighting operations. Officers are constantly making decisions and giving orders. It is essential that information be passed on rapidly and clearly. Difficulties have been encountered in the use of radio equipment, particularly in highrise buildings. Specific problems were encountered at the Inn on the Park and in the St. Joseph's Hospital fires. Present radio communication interference in highrise buildings causes the performance of equipment to be less than satisfactory. The City of North York Fire Department indicated it is presently upgrading its communication system by purchasing better radio equipment.

An examination of the jury recommendations from the Inquest into the deaths in the Inn on the Park, suggests that an additional radio channel would have been of assistance. If examination by the OFM supports the proposition that this problem is one of general application throughout the Province, it would appear most effective for applications for additional radio channels to be dealt with in a coordinated manner. These applications must be made to the Federal Department of Transportation and Communications.

Finally, I was advised that the Ontario Association of Fire Chiefs has made the following recommendation to the Solicitor General:

> "With respect to police forces, the Government funds the purchase of radio equipment on a varying scale, depending upon the size of the system. Furthermore, the Province sets Province-wide standards for equipment and frequencies. This approach ensures that equipment of this nature will be in place and will be of a standard that is adequate. No comparable controls exist with respect to fire department radio equipment. We recommend that at the very least the Province undertake a study to determine the adequacy of the present level of equipment in use, and consider earmarking grants to municipalities to ensure the purchase of adequate equipment in the future."[27]

Staging and Smoke Migration:

In highrise buildings it is necessary for the fire department to fight the fire from inside the building. Normally, firefighters take the elevator to the floor below the fire floor, attach hoses to the standpipe on that floor, enter the stairwell and carry their equipment to the fire floor, open the door to the fire floor and proceed to fight the fire. While there was no suggestion that there is any more efficient way of fighting fires while considering the safety of the firefighters, this method of fighting highrise fires has contributed to smoke migration into the stairwells in many fires reviewed by the Inquiry and described in Chapters 3 through 6. It is my hope that the use of smoke barrier doors in some buildings will help to alleviate this problem.[28]

One other technique that might be of assistance in maintaining clear stairwells is "bottom-venting". This term causes some confusion, because this technique is not "venting" in the sense of clearing smoke *out of the building*. Ordinarily, the term "venting" means to provide some way of removing smoke and heat during and after suppression, by the use of windows, panels or smoke shafts. "Bottom-venting" however is actually a method of using natural stack action to pressurize a stairwell. In cold weather, if the stairwell has a door at the bottom that leads to the exterior, the opening of that door will cause exterior air to move into the stairwell. This raises the pressure in the stairwell as compared to the pressure in the rest of the building and assists in keeping the stairwell clear of smoke.

The Handicapped:

In the past, the fire service has been able to respond to special needs of the handicapped by preparing for suppression and rescue in institutional buildings. Because persons with various disabilities are now more integrated in residential buildings and in the work place, it is necessary for the fire service to be able to respond to their need for assistance in other than institutional buildings.

The City of Toronto Fire Department provides firefighters with special training in evacuation of the handicapped. Byron Johnson of Springfield Environmental Research has done a study of evacuation of the handicapped for the National Research Council. According to Mr. Johnson:

> "...the evacuation of disabled persons does require special consideration, requires special planning and. . .evacuation by stairs of non-ambulant persons. . .although generally practicable,. . .is never desirable if another way of insuring safety can be found."[29]

I recommend Mr. Johnson's study to those in the fire service who are responsible for the training of firefighters in evacuation techniques.[30]

Fire safety plans must make reference to persons in need of assistance, and make provision for their safety. The fire service can be of further assistance due to their advisory role in assisting owners to prepare fire safety plans. The procedures proposed by owners in fire safety plans could be reviewed by the fire service when approving and subsequently updating the plan. In order to give positive input into the plans, the fire service itself must become more aware of the special needs of disabled persons, and the best ways to offer assistance.

TRAINING FOR THE FIRE SERVICE:

Generally, the training of fire department personnel is done on an in-service basis.

> "Firefighting training is performed with the department's own equipment under its individual conditions of operation. . .A strong reason for the training being centred within the individual fire department is that, unlike police who have central provincial training for recruits for the most part, most firefighters are volunteers and it is difficult for them to get away from their regular jobs for central training."[31]

As I explained at the beginning of this Chapter, many fire departments in Ontario are made up of both full-time and volunteer firefighters (composite departments), while others are totally volunteer. Departments in major centres are made up of full-time staff. The sophistication of the training offered varies with the size of the municipality served and the resources available from the municipality.

In large centres, the training of firefighters can be detailed and ongoing. Ideally, a recruit would get basic training and, subsequently, updating and drill. Specialist training would also be available, allowing certain staff members to become skilled in fire prevention, inspection, investigation and public education.

Assistant Deputy Chief William Sproule of the City of Toronto Fire Department described the Toronto Fire Academy. The Academy offers basic training and specialist courses. He added that special attention is given to evacuation techniques to be used for handicapped persons. This is part of basic training, and is also treated as a special area in honing skills not used on a day-to-day basis. Assistant Deputy Chief Sproule commented that there are training facilities in other cities which are designed to meet the needs of the individual community.

Chief William Wretham of Scarborough explained that his firefighters get basic training within the department. A number of years ago, the Robarts Commission recommended standardized training for the fire service throughout Metropolitan Toronto. In response to that recommendation, the Metro Fire Chiefs, with the cooperation of the Ontario Fire Marshal, established a curriculum and provided a course for firefighters within Metropolitan Toronto. For this pilot project, the fire service was able to use the facilities of the Toronto Fire Department and the Toronto Fire Academy. The first course was completed in mid-1982. Chief Wretham expressed the hope that the basic training of firefighters would eventually be done at the provincial level.

In Scarborough and the City of Toronto, as well as in the other major centres, basic training includes some specific training with regard to firefighting in highrise buildings. Further, Chief Wretham described an audio-visual presentation which has been designed for use in the District fire stations in Scarborough. This specific presentation deals with the use of voice communication systems. Audio-visual presentations appear to be particularly beneficial for in-service training, because they are accessible to the firefighters on shift work.

Recommendation:

12.6 The Office of the Fire Marshal should further develop its method of monitoring advances in both technical research and firefighting procedures, and should continue to distribute the information to municipal fire department training officers.

Chief Wretham explained that, although procedures throughout the Province are fairly uniform, there is no provincial standard for the training of firefighters. Many municipalities take advantage of the provincial training centre (The Ontario Fire College) by sending many of their officers there. This appears to have contributed some uniformity to the training given by officers to firefighters in the field.

Mr. George Tamura of NRC believed that firefighters must know the basic operation of life safety systems. He explained that if something should go wrong with the pressurization system, for instance, the firefighters on the scene should be able to take rational, corrective measures. He believes that it is essential for firefighters to be quite knowledgeable in this area. He also described the advantages of a procedure called "bottom-venting", which is simply a matter of opening stairwell doors to the exterior of a building in certain weather conditions in order to pressurize stairwells.[32] Chief Wretham testified that he was not aware of the benefits of bottom venting.

The Inquiry also received evidence about a study done for NRC regarding methods of evacuation for disabled persons (Exhibit 280). Mr. Jake Pauls, a research officer with NRC, commented that the education of fire service personnel in some of the human factors is also important, as the fire service is the front line of defence. He said that a university level course has been developed by the International Association of Firefighters, but that no Canadian University is offering the course at the present time.[33]

One mechanism for distributing information regarding advances in both technical research and firefighting procedures to the fire service, the people who could get the most benefit from it, is the OFM publication, "The Quarterly News". Publications of this sort could also be the means whereby various fire departments could share programs that they have developed for their own inhouse use.

The Ontario Fire College is a facility in Gravenhurst, run by the Office of the Fire Marshal. The power to maintain a central fire college is given in the *Fire Departments Act*. Municipal fire departments can send certain of their personnel to the Fire College for intensive courses. The College was highly praised by everyone who had involvement with it. One major problem was identified. Assistant Deputy Chief Sproule of the Toronto Fire Department testified that the demands on the College were so high that he has been able to send only four of his fire prevention officers in the past two years. John Bateman, the Fire Marshal for Ontario, advised the Inquiry that the accommodations for the facility are presently being expanded. He added that it has been suggested to him that the Technical Education Facility of the Fire College will also be expanded.

The Ontario Fire College is attended by officers from the various fire departments. These officers include persons responsible for the training of staff in the departments, as well as those taking specialist training.

Recommendation:

12.7 There should be a stronger emphasis on fire prevention, as distinct from suppression, within the fire service.

The fire service has been involved in fire prevention for many years. Fire prevention includes public education, enforcement of codes, and plans review.

In the study of the fire control systems in Canada, Mr. Baird observed that as a general matter, there are cogent reasons for involving the fire service in matters other than suppression. He acknowledged, in making these remarks, that there is an insufficiency of academic and professional qualifications in the fire service. Notwithstanding this limitation, he disagreed with suggestions that the role of the fire service in certain aspects of fire prevention should be limited:

> "As to the question of qualifications, I believe that it would make much more sense in the long run to upgrade the qualifications of the fire service and fire protection engineering and technology, than to teach fire protection and a dedication to it to any other agency."[34]

Representatives from some of the larger fire departments discussed their public education programs. These tend to include school visits, attendance at public meetings, and the distribution of literature. I comment that, in order to effectively undertake public education, it is necessary to "educate the educators".

Although most fire departments have been involved in enforcement of local fire prevention by-laws for many years, they have recently been given new duties with regard to the enforcement of the Ontario Fire Code. Not only will they have to be aware of the proper administrative procedures involved in laying charges under the OFC, they will also have to be thoroughly familiar with the requirements of that Code and the proper methods of doing inspections. Mr. Roy Philippe of the Office of the Fire Marshal advised the Inquiry that his office is presently preparing a manual to assist the local fire departments in carrying out their duties under the OFC (Exhibit 288). This should constitute a strong educational tool to be used by fire prevention officers in various municipalities.

It was suggested that the municipalities should have the flexibility to assign whatever staff they have, on the basis of their needs and competency of their staff, for the purposes of carrying out pre-construction or pre-renovation plans review. It appears to me that the OBC already contemplates this need, by allowing the municipality to assign certain portions of plans review to the fire service (Section 2.11). It has been suggested in the past that all plans review should be strictly a concern of the building officials, the argument being that those officials are better qualified than members of the fire service to undertake those duties. While that position has been a source of controversy in the past however, it was not strenuously advanced before this Inquiry.

Where a municipality decides to assign some plans review functions to the fire service, it should be prepared to support the need in the fire service for persons with professional qualifications.

[1] *Handbook of Municipal Fire Protection in Ontario*, Office of the Fire Marshal of Ontario, 1981.

[2] Exhibit 3 is the Organization Chart of the Office of the Fire Marshal.

[3] *Fire Marshals Act*, R.S.O. 1980, c.166, s.3.

[4] Transcript, Volume 39, p. 11.

[5] Pursuant to the *Fire Departments Act*, R.S.O. 1980, c.164, s.14, the Lieutenant Governor in Council may make regulations regarding standards for equipment. There is one regulation, R.R.O. 1980, Reg. 393, prescribing standards for pumpers. There are also certain standards for fire hydrants set out in the FMA itself.

[6] Transcript, Volume 39, p. 14.

[7] *Fire Marshals Act*, R.S.O. 1980, c.166, Section 3(g).

[8] Further comment about the collection of statistics is made in Chapter 1.

[9] Exhibit 286.

[10] Exhibit 288.

[11] *Fire Departments Act*, R.S.O. 1980, c.164, s. 13.

[12] Transcript, Volume 39, p. 17.

[13] For example, see comments of Chief Wretham to the Standing Committee on the Administration of Justice, Exhibit 64, p. 6 and following.

[14] Brief 29, p. 6.

[15] Transcript, Volume 7, pp. 60 and 61.

[16] Transcript, Volume 39, p. 7.

[17] Exhibit 64, p. 17.

[18] Exhibit 303 shows that a fire department inspector visited the premises to investigate a complaint in November, 1981.

[19] Transcript,Volume 8, p. 38.

[20] Transcript, Volume 59, p. 71.

[21] Brief 29, p. 6; see also Brief 40.

[22] Transcript, Volume 7, p. 63.

[23] Chief William Wretham, Transcript, Volume 7, p. 98; W. Wretham, Transcript, Volume 44, p. 8.

[24] Transcript, Volume 44, p. 9.

[25] OFC, Subsection 2.8.2.

[26] See also Chapter 15.

[27] Transcript, Volume 7, p. 73.

[28] See Chapter 10.

[29] Transcript, Volume 35, p. 65.

[30] Exhibit 280.

[31] Switzer and Baird, *Study on Fire Prevention and Control Systems in Canada*, 1980, p. 84.

[32] For discussion of smoke control generally, see Chapter 7.

[33] Transcript, Volume 37, p. 97.

[34] Transcript, Volume 33, p. 74

Chapter 13

Education

INTRODUCTION

> "Examination of the weaknesses in the fire loss control systems in Canada makes it obvious that the main weakness results from problems of education, or the lack of it.
>
> This lack applies to firefighters, fire chiefs, code enforcement officials, architects and children.
>
> In addition to great deficiencies in training and qualifications for professionals in the field, there is a great need for public education.
>
> This takes in municipal management, management of private business, politicians, judges and prosecutors in the courts, the police, architects, engineers, and in fact every member of Canadian society."[1]

In order to respond to a brief from the Association of Canadian Fire Marshals and Fire Commissioners and the Canadian Association of Fire Chiefs recommending that it establish a national committee on fire services, methods and equipment, the National Research Council commissioned a study on fire prevention and control systems in Canada. A report by R.W.A. Switzer, a former Dominion Fire Commissioner, and D.M. Baird, of the Insurers Advisory Organization of Canada was tabled in September of 1980. Mr. Baird was also the author of the brief submitted to this Inquiry on behalf of the Fire Underwriters' Survey (Brief 42).

One of the conclusions of the 1980 report was that there is a vital need for education in fire matters, both within and outside the fire service. Two of the recommendations made by Mr. Switzer and Mr. Baird were:

> 1. The Provinces and Territories should establish a vigorous and competent program in fire prevention and enforcement and public education as a combined effort of the Province and its municipalities with particular emphasis on life safety.
> 2. The Provinces, through the Fire Marshal or Fire Commissioner, in collaboration with education and trades jurisdictions of the Province where necessary, should assume responsibility for insuring training of firefighters at all levels from elementary to technical specialities and administration.[2]

Evidence heard by this Inquiry illustrates that comprehensive and uniform education is necessary at several levels. I will be discussing this topic under the following sub-headings: Building Superintendents, Building Code Officials, Design Professionals, Trades and the Public. My comments about education in the Hotel industry and in the Fire Service are found in Chapters 4 and 12 respectively.

It is important to understand that the strongest advocates for further and better education for any specific group came from representatives of that group who appeared as witnesses and submitted briefs to this Inquiry. One might expect a tendency to criticize the understanding of others. The fact that comments were generally more inwardly directed indicates that the subject was examined very thoughtfully by persons making submissions. It also strengthens the reliability of my findings that education is necessary for each of the groups I have listed.

BUILDING SUPERINTENDENTS

Recommendation:

13.1 The Office of the Fire Marshal should develop materials to be included in courses given to building superintendents at the community colleges, emphasizing the contents of the Ontario Fire Code, the reasons for and significance of regular maintenance, and the procedures to be followed in emergencies.

Mr. Earl Hunter is the superintendent of the Manufacturers Life Centre in Toronto. This is a large, mixed occupancy building. He is also a member of the Toronto Building Superintendents Association, and an instructor in Building Environmental Systems at Seneca College.

Mr. Hunter was very candid about his experience in dealing with building staff and other superintendents. In his experience, very few of those persons have an adequate understanding of the significance of proper maintenance for life safety, or of the procedures to be taken in the event of a fire. Mr. Hunter believes that education is one of the most important parts of fire safety. He suggests that anyone who is in charge of a high building should be educated by means of a mandatory course. He believes that superintendents generally understand the mechanical systems in their buildings, but that many were confused about fire alarm systems and evacuation procedures. He submitted:

> "We realize that it is almost impossible to have enough [public inspection] staff to make sure the [OFC] is enforced. Here is our chance to educate the people in charge [of the building] and make them the inspectors or enforcers by having an thorough knowledge of life safety."[3]

As noted above, Mr. Hunter is involved in the Building Environmental Systems Course offered at Seneca College. He is presently rewriting part of that course to add six lessons on life safety. He informed the Inquiry that there is another course offered at Seneca College in conjunction with the Canadian Fire Safety Association, entitled "Fire Safety".

Mr. G.V. Tatham, the Senior Vice-President of the Canadian Division of the Oxford Development Group Limited, appeared as a witness for the Building Owners and Managers Association (BOMA). In the late 1960's a decision was made by the officers of BOMA that professional education was required for the members of their industry. An education arm of BOMA was created, called the Building Owners and Managers Institute (BOMI). Mr. Tatham is the Board Chairman of BOMI. Through BOMI, two types of training programs are offered. One program, which leads to a designation as a Real Property Administrator, seems to be directed to building managers. BOMI also gives a trades level program which allows persons to become designated as Systems

Maintenance Technicians, and finally, Systems Maintenance Administrators. Part 1 of the trades level program is a course directed to heating, plumbing and fire protection systems.

The Toronto Fire Department, through the Toronto Fire Academy, offers three-day seminars to building superintendents and managers. I understand that Humber College, in Ontario, is presently designing a course to be offered to these persons. Finally, Mr. Jack Gringorten, Vice-President in charge of Property Administration for Olympia & York, has written a manual for use by building managers which is soon to be published.

There is no guarantee that the information in these courses and manuals is complete, correct or uniform. For that reason, I believe it is necessary to develop the sort of materials referred to in Recommendation 13.1. I have been impressed by the dedication and knowledge of Roy Philippe, Chief of Consulting Services in the Office of the Fire Marshal. Although it will be necessary for him to have added support if his unit is to undertake a project such as the coordination of educational material for building superintendents, I feel confident that with support, he is capable of developing course materials that could be used in the Community Colleges now, and could form the basis for a certification requirement in the future.

Recommendation:

13.2 The owners of highrise apartment and office buildings should intensify their efforts to make formal training available to building staff by supporting the development of courses at the community college level, and encouraging staff to attend.

Recommendation:

13.3 The Ministry of Colleges and Universities, together with representatives of the owners of highrise apartment and office buildings and others presently involved in training of building superintendents, should set a long-range goal for training, and the ultimate certification of building supervisory staff.

Mr. Jaffary made the submission that a requirement for certification of building staff would be premature if there is not a sufficient qualified labour pool. He added that certification would be a very good idea and that the apartment industry sees this requirement coming in the future. This view is shared by the Federation of Metropolitan Tenants Associations, (Brief 33) who submitted:

> "Superintendents should be required to take designated life safety courses set up for this purpose at community colleges. The courses would lead to a licence to be a superintendent. Of course, this program would have to be phased in to allow existing superintendents to take the courses.
>
> The courses should include instruction in life safety systems and in human behaviour during a fire to ensure that the superintendent can be of some use in maintaining equipment and taking "front line action" during a fire."

I agree with Mr. Jaffary, that a requirement for certification *today* would be unreasonable, and that a trained labour force should be developed *in the interim.*

The curriculum for the ultimate certification courses will have to be considered, as will the delivery of courses throughout the Province.

One matter that should be considered for the course curriculum is the operation of the voice communication system. Experience with voice communication equipment has shown that not every voice is clearly projected. As a result, where there is a choice of operator, the selection process should consider this fact. The clarity of the message is affected by things such as the manner of speaking into the microphone, where the microphone is held, and the rate of speech. These matters should be the subject of training for those who operate voice communication systems.

The content of the messages which are transmitted should also be controlled in some fashion. As discussed in Chapter 14, the less anxiety and stress experienced by occupants in a fire emergency, the more likely they are to engage in positive action. Ambiguous messages, in an already stressful situation, whether caused by poor wording or lack of transmission clarity is to be avoided. In terms of what to say and how to say it, input from people knowledgeable about human behaviour would be valuable.

Another matter for consideration in these courses is the proper control of HVAC systems. In fire emergencies, where the HVAC system does not shut off automatically on the sounding of a fire alarm, the system should be shut down manually. This is necessary to prevent smoke migration through the system.

BUILDING CODE OFFICIALS

The major responsibility for enforcement of the OBC falls to the local Building Code officials. The OBC provides for the involvement of the fire service in plans review where the particular municipality chooses to allocate the responsibility for certain portions of plans review to the Chief Fire Official.[4] According to George Fleming, Chief Building Official for Scarborough, in some smaller municipalities, the chief of the fire department is, in fact, the Chief Building Official. In others, certain portions of plans review are delegated to the fire department. For instance, in Scarborough the fire service assists in the designing of site layouts and examines shop drawings of sprinkler systems and fire alarm systems. In most municipalities, some form of protocol exists between the two departments.

Recommendation:

13.4 The Province of Ontario, through the Building Code Branch of the Ministry of Municipal Affairs and Housing should make funds available for the implementation of training for Building Code officials at the provincial level.

Although there has been education at the provincial level for the fire service for some years, this has not been the case for building officials. Rashmi Nathwani was the Director of Education for the Ontario Building Officials Association for eight years. While that Association has attempted to provide some education for its members, all courses are voluntary. At present, there are three one-week courses offered, one on Part 3 of the OBC, one on Part 4 of the OBC, and one on legal aspects of code administration. Mr. Nathwani mentioned that there is a specific need for education of building officials which would allow them to understand engineering reports and assess proposed smoke control systems.

George Fleming advised the Inquiry that building officials in Ontario are not normally professional engineers, although their qualifications vary with the size of the municipality they serve. In his view, there are very few qualified people to carry out the functions that the OBC provides for, and most of them are in major centres. He believes that building officials should be aware of the basic principles upon which smoke control measures are designed in order to allow them to evaluate plans and also to do field inspections. He stressed that the training of building officials should be designed to allow them to communicate with the design professions. Courses should be offered that deal with all aspects of construction, how to examine, how to inspect, and what the Code requirements are. He believes that a Building Code official who simply goes by the book is not doing the job that the public ought to, and does expect. He commented:

> "What I am trying to strive for is to get knowledgeable, able people administering the regulations that they are required to administer, and by knowledgeable and able, I mean not only by what the regulations require, but [able to] understand why they require them so they can apply them with intelligence. . ."[5]

Mr. Fleming expressed concern that building officials in smaller municipalities could be faced with the task of inspecting plans for a building which would be beyond their education and competence. He suggested that in these cases, it may be necessary to have provincial inspectors who could inspect buildings. These buildings could be highrise buildings. As an example, he discussed a hypothetical hotel in a resort area.

The Ontario Building Officials Association recently received sufficient funding from the Province to allow them to develop a course curriculum. Once the curriculum is complete, the course must be made available to building officials throughout the province. The presentation of the course will require the financial support I have recommended.

Both Graham Adams and George Fleming said that, eventually, the course should evolve into or be part of some type of certification program for building officials.

Recommendation:

13.5 Municipalities should encourage and assist building officials to take advantage of any courses for their benefit, with a view to having staff capable of being certified building officials in the future.

Mr. Fleming suggested that it would be an expensive proposition for someone to leave municipal employment in order to attend courses. Surely the municipality, which would be gaining better qualified and more efficient staff, should bear some responsibility for assisting these persons to become more qualified and, eventually, certified building officials.

THE DESIGN PROFESSIONALS

The OBC requires an architect, a professional engineer, or both to be involved in the design and general review of the construction of a highrise building.[6]

Recommendation:

13.6 The Association of Professional Engineers of Ontario and the Ontario Association of Architects should encourage universities to establish fire protection courses at the university level; and such courses should deal with both technical and social aspects of building design.

The members of the design professions (architects and engineers) and representatives of regulatory agencies such as municipal building departments and the Office of the Fire Marshal with which they must deal, agreed that there is a need to improve the type of fire safety education that architects and engineers receive during their formal training.

Mr. John Bateman, the Ontario Fire Marshal, testified that in his experience many graduates who become involved with the plans approval activities of the Office of the Fire Marshal are "pretty naive and ignorant of this aspect (fire protection and fire safety generally) of their profession."

Although this comment may not be accepted by all members of the design professions, the architects and engineers who appeared before the Inquiry were in agreement that there is insufficient emphasis on fire safety during the formal training of the design professional, and this situation should be changed. The Inquiry was advised that only a handful of universities in North America include fire safety courses in their architecture and engineering programs. Donald Boehmer, a professional engineer and one of the few Fire Protection Specialists designated by the APEO, testified that at the present time, building codes and fire safety do not form part of the curriculum in either the schools of architecture or engineering in Canada.[7]

The Brief submitted by the Office of the Fire Commissioner, Province of Manitoba addressed this issue. It states:

> "Another area of concern is what appears to be the lack of interest by building designers in fire safety. The chief goals of the designers appear to be to plan a building that serves its intended architectural function, as pleasing in appearance as possible and as cheaply as possible. Fire safety lags behind other considerations such as aesthetics and economy in the design of buildings. To overcome this problem schools giving degrees in architecture and engineering might well include in their curricula at least one course in fire safety."[8]

There is a difference of opinion regarding the extent to which the education of the design professional regarding fire safety should involve the teaching of technology. This is an issue which I believe will have to be resolved in developing course content. It is my view, however, that whatever the actual course content might be, upon graduation from a school of architecture or engineering, the design professional should have been exposed to the basic principles and techniques of fire safety. They should also have an appreciation of how those principles are dealt with in codes.

Further, Dr. John Keating highlighted the necessity for architects and engineers to have an appreciation of human behaviour in fires:

> "We have to begin to expose designers to the human needs of people, so that they can design buildings that are responses to these needs and tendencies. And to do this, we must further investigate the way people actually behave in various fire situa-

tions. . .if we know how people tend to behave in fires, we can take some classical findings on well established, psychological theory and see how they translate to the fire situation, which could guide us in creating building codes with an eye to human responses. If we begin to find the human behaviours that are dominant, easy and easily remembered, we then can begin to translate this information to real application in fire drills and evacuation plans. We can begin to talk effectively to architects, to designers, and to people responsible for public buildings to make sure they are not misinformed about how people will behave during actual evacuation."[9]

TRADES

The Inquiry did not undertake a general review of the construction industry in order to determine what importance, if any, is attributed by that industry to fire safety. There were, however, two issues which were raised by the evidence and which were the subject of considerable comment. The first issue relates to fire stopping; the second issue relates to mandatory licensing of trades.

Fire Stopping:

Recommendation:

13.7 ***All those who construct, alter or renovate buildings or install services which cause breaches in fire separations should be made aware of the extreme danger to life resulting from their failure to comply with code requirements as to fire stopping.***

An examination of the contributory causes to life and property loss in highrise fires identifies open vertical and horizontal shafts and poke-through construction as major problems which must be addressed.

These two contributory causes were evident in the fires at the Inn on the Park and MGM Grand Hotel (described in Chapter 4), the St. Joseph Hospital Fire (described in Chapter 6), and the apartment fire at 88 Bloor Street East (described in Chapter 3). They were also the most common contributory cause to life and property loss in 35 fires reviewed by the Governor's Commission on Fire Safety Codes (State of Nevada) whose report was issued in March of 1981.[10] In all those fires, open service shafts or poke-through construction were a major path of smoke migration.

The OBC contains provisions for fire stopping (3.1.7, 3.1.9), and the OFC provides that where fire separations between major occupancies, rooms, corridors, shafts and other spaces are damaged so as to affect the integrity of their fire resistance rating, the damaged fire separations must be repaired so that the integrity of the fire separation is maintained (OFC 2.2.1.1 and 2.2.2.1). The importance of fire stopping was emphasized by Mr. Paul Meleta, of the Scarborough Building Department. He stated that the control of poke-through construction is the major duty of a building official, and occupies practically 90% of his time.[11]

Fire stopping is not treated as important by the various trades. This was apparent from the evidence of many witnesses, including Mr. Meleta and Dr. John Bryan. Mr. Meleta said:

> ". . .most people don't know what they are doing when they do poke a hole through. Their concern is to get in quick and

> get on to the next job. The tradesmen have a very, very scant view of the results that fire stopping have. I fully agree that a little thing like that, given some public or some means of display to the public, would have a tremendous effect. . .because it's such a little thing. . .which causes such a big problem."[12]

With reference to the MGM Grand Hotel fire, Dr. John Bryan stated:

> ". . .people doing the construction do not understand the importance of a ½" space around a stair enclosure; the individuals do not understand the reason for that kind of construction requirement being there relative to fire and smoke spread. . ."[13]

A witness from the sprinkler industry testified that it would be fair to assume that the installers of sprinker systems do not appreciate the significance of proper fire stopping after poking a hole through a fire separation.[14]

Although the level of inspection during construction has an impact on compliance with the requirement to install fire stopping, it is appreciated that the public inspector cannot be everywhere at the same time. For that reason, it is imperative that the attempt to solve this serious problem be made by impressing upon the construction industry the significance of fire stopping.

The evidence indicates that such an approach might improve this situation. For example, based on past experience, Mr. Peter Goering, a practicing architect, testified that if a tradesman appreciates the significance that his work has in the overall construction process, it is not unrealistic to expect a better end result. When dealing with how the problem of fire stopping should be addressed, a witness called on behalf of the sprinkler industry testified that if the trades and professions were aware that the failure to fire stop created a terrible problem, he believed that they would respond positively.[15]

The failure to properly fire stop is not limited to new construction. It is a problem which arises in existing buildings when various trades become involved in renovation work or installing services such as T.V. cables or telephone lines. According to Mr. Boehmer, fire stopping is especially important in office buildings where there are changing tenants which result in electrical and mechanical services being changed within the building.

This is a matter of such great importance that it requires immediate action. Dissemination of information is within the jurisdiction of the Office of the Fire Marshal.[16] The Fire Marshal's powers are broad enough to allow, as a first step, the use of the media to bring this difficulty to the attention of all those who are required to fire stop.

Thereafter, the OFM should encourage all those in the building industry and installers of services to advise all members of their associations, trades, and companies of the existence of this problem. In Chapter 2 I stated that the time has come for strict enforcement of the OBC and Ontario Fire Code. I view a breach of fire stopping as such a serious matter that failure to follow the provisions of the Codes in this respect should carry a very substantial fine.

Certification/Licencing of Trades:

Recommendation:

13.8 It should be mandatory for persons installing or maintaining sprinkler systems to be licensed.

Subsection 1.1.6 of the OFC is entitled "Licencing of Persons Installing or Maintaining Fire Protection Equipment". It is marked "Reserved".

The regulations to the *Apprenticeship and Tradesmen Qualifications Act* provide for an apprenticeship program leading to a designation as a "sprinkler and fire protection installer".[17] This is a voluntary certification. There is no regulation imposing minimum qualifications on those who install or maintain sprinkler systems.

Evidence was received that the installation and maintenance of sprinkler systems requires the special type of training included in the training programs established for the certified trade or sprinkler and fire protection installer. No evidence to the contrary was received.

Mr. Hart, Director of the Maintenance Engineering Branch of Ontario Housing Corporation, advised the Inquiry that in 1980 OHC began to question the competence of some of the people servicing fire alarm systems and sprinkler systems, and that this questioning arose as a result of complaints from different areas in the Province. The Ontario Housing Corporation concluded that some of the companies working on their sprinkler systems were not employing technicians of sufficient calibre to understand the systems in some of their buildings, particularly in the highrise apartment buildings.[18] I am sure that the concerns mentioned by Mr. Hart were major reasons for Mr. Beesley, the General Manager of OHC, urging the Inquiry to recommend the establishment of a certified training program for testing fire, security and life safety systems.[19]

There has been correspondence between the Canadian Automatic Sprinkler Association and the Honourable Dr. Robert Elgie, Minister of Consumer and Commercial Relations, regarding mandatory licencing of persons who install or maintain sprinkler systems. When the Building Code Branch was transferred to the Ministry of Municipal Affairs and Housing, Dr. Elgie wrote a letter to both the Honourable George W. Taylor, Q.C., Solicitor General, and the Honourable Claude Bennett, Minister of Municipal Affairs and Housing. In those letters, he dealt with the request of the Canadian Automatic Sprinkler Association that the Government deal with this licencing issue. He stated:

> "It is apparent that the proper installation of sprinkler systems is a very important aspect of the life safety system in many buildings. It follows that the installation of sprinkler systems must therefore be carried out by competent tradesmen and in compliance with the applicable codes."

When dealing with qualifications for this trade, Dr. Elgie also stated:

> "The Regulations under the *Apprenticeship and Trademen's Qualifications Act* would appear to deal satisfactorily with the qualification aspects, leaving only the question of licencing or other control to be resolved."[20]

In my view, these comments support my recommendations.

This recommendation is not designed to have all "checks" and "inspections" required by the OFC to be done by licenced or certified trades. The OFM should advise which "checks" and "inspections" are those which do not require this expertise.

Recommendation:

13.9 It should be mandatory for persons who maintain or verify fire alarm systems to be licensed.

In Chapter 8, I deal with fire alarm systems. In that part of the report, the reader will find the description of the three standards relating to the installation, verification and maintenance of fire alarm systems.[21]

Mr. Gerry Landmesser, President of the Canadian Fire Alarm Association, urged the Inquiry to make this recommendation. It was his evidence that this work requires special knowledge and in some situations, special testing equipment is necessary in order to do an adequate job. Mr. John Hess is a member of the standard-writing committees that prepare the three standards referred to above. He supported Mr. Landmesser's recommendation. No evidence contrary to this recommendation was received by the Inquiry.

The draft OFC as recommended by the Advisory Committee on the OFC provides support for my two recommendations for mandatory licencing of those involved in the sprinkler trade and portions of the fire alarm industry. The commentary to Subsection 1.1.4 of the draft OFC, circulated for public comment, stated:

> "This code contemplates the development and enforcement of requirements for qualifications of tradesmen in the fields of fire alarm, fire detection, and fire protection (extinguishing) systems with reference to installation, repair and servicing.
>
> (a) Qualification shall be recognized by means of a suitable qualification document which may be cancelled on evidence of inadequate performance.
>
> (b) Consideration should be given to Provincial licensing of such trades or services, or industry self-regulation. This may be achieved by introducing regulations under the *Fire Marshal's Act* [sic] (section 26e and 26g). i.e. The following activities have been identified as in need of regulation: Installation and maintenance of:
>
> (i) Portable fire extinguishers
>
> (ii) *Fire alarm and detection systems*
>
> (iii) *Fire suppression systems including sprinklers* and special extinguishing systems
>
> (iv) Central alarm and control facilities."[22] (italics added)

Although that section proposed regulation for the installation and maintenance of life safety systems other than sprinklers and fire alarm systems, there was insufficient evidence before this Inquiry to comment upon those other systems.

Like recommendation 13.8, this recommendation is not designed to have all "checks" and "inspections" required by the OFC to be done by licenced or certified trades. The OFM should advise which "checks" and "inspections" are those which do not require this expertise.

PUBLIC EDUCATION

The briefs submitted by private citizens and the evidence of both tenants and representatives of the fire service clearly indicated that occupants of highrise apartment buildings are confused about the most basic question to be answered in a fire — "should I stay or should I leave?". Dr. Ann Cavoukian came to the same conclusion based on responses to the questionnaire she prepared for the Inquiry (Exhibit 185).

The action to take in a fire emergency is but one of many subjects which must be addressed by an extensive public education program. In this Chapter, I will review the evidence which clearly establishes the need for increased educational efforts directed to the public. I will also suggest possible subject matters for such a program, and the methods by which the desired messages might be conveyed. My belief that public education can be an effective means of improving our fire record will also be discussed.

Recommendation:

13.10 The Office of the Fire Marshal should receive sufficient funds to implement a more active public education program.

When approaching the topic of public education, it must be noted that the Section 3 of the *Fire Marshals Act* imposes legal obligations on the Fire Marshal. It states:

> 3. Subject to the regulations and for the prevention and investigation of fire, it is the duty of the Fire Marshal and he has power,
>
> (d) to disseminate information and advice as to the prevention of fire by means of public meetings, newspaper articles, pamphlets, exhibitions and moving picture films and otherwise as he considers advisable;

The legislation which imposes these obligations on the Fire Marshal does not specify the quantity or quality of information and advice that must be conveyed. I have concluded that more attention must be given to this responsibility.

This lack of attention is partly the result of inadequate funding for necessary programs. John Bateman, the Fire Marshal, testified that his Office would like to become involved in producing films regarding fire safety, but because of the lack of funds, his Office was prevented from doing so.

The fire safety plan which must be prepared by every owner of a highrise building (OFC Article 1.1.1.1) is one means of educating the residents about evacuation procedures and general fire prevention.

I cannot say that all owners of highrise buildings are failing to use the fire safety plan as a vehicle to educate those who live or work within their buildings. In some cases, I was impressed with the efforts being made by owners to prepare occupants for fire emergencies through the dissemination of fire safety material, the preparation of detailed fire safety plans, and the holding of regular fire drills. I must conclude, however, that the occupant who is well prepared because of information given by building owners is the exception rather than the rule. Keeping in mind the restrictions on occupants in institutional settings, this statement is applicable to all highrise occupancies.

Although there are laws against causing false alarms and vandalizing fire safety equipment, there is no *legal* responsibility on the occupants of highrise buildings to learn "what to do" in a fire emergency. In fact, the evidence suggests that tenants of highrise apartment buildings and occupants of other highrise buildings are generally apathetic about fire safety. This is so even though the evidence suggested that there is presently an increased interest in fire safety among these groups.

This apathy was the subject of comment by a number of witnesses. For instance, George Coleman, of the Metropolitan Toronto Housing Co., stated:

> "There may be too much emphasis upon people thinking the fire department is going to solve their problems. People generally have to understand what happens in case of fires, where the risks are, and understand some of the sort of things that they can do themselves. That type of education program has to be reinforced both by the building owners and by the fire department."[23]

Dale Martin, the Chairman of the Federation of Metro Tenants Associations, stated that there was no doubt that tenant apathy exists. He was not surprised that there has not been a good turnout to meetings dealing with fire safety in the past. In his opinion, there was a general problem of public awareness. He suggested the best solution to the lack of public awareness is to use the vehicle of the tenants associations themselves.

Earl Hunter, the Superintendent of a large, mixed use highrise building in Toronto, and President of the Toronto Building Superintendents Association, testified that in his opinion there was general apathy regarding fire safety among both tenants and superintendents.

I must stress that notwithstanding the fact that there is no legal obligation upon occupants to become involved in fire safety, they should be responsible and, to the greatest extent possible, take action themselves to insure the level of life safety within their buildings is adequate. The educational program I have recommended should encourage occupant participation by increasing their awareness of the importance of fire safety.

Stay or Leave?

What should occupants in a highrise building do if a fire occurs in their suite or office? In this situation, it is clear that the occupant should leave the area of fire origin, close all doors between the room of origin and other areas of the building, activate the fire alarm, evacuate the building, and call the fire department. The importance of closing the doors must be impressed upon all occupants through the educational program I have recommended. The disasterous results that can occur because doors are left open were clearly illustrated in the fires at 88 Bloor Street East (Chapter 3), and the Westchase Hilton Hotel (Chapter 4). The effectiveness of closed doors in reducing smoke migration was illustrated in the fire that occurred at the Sunnybrook Hospital which is reviewed in Chapter 6.

What should occupants in a highrise building do if they hear the fire alarm? Major confusion regarding the proper action to take exists for those occupants who hear the fire alarm but do not know where the fire is. There is uncertainty whether to stay in their room or leave the building.[24] Although less confusion exists regarding the action to take if evacuation is impossible, there is still much to be done to increase knowledge of how to "defend in place" if one cannot leave one's room.

Education regarding the proper action to take when the alarm sounds in a building must be high on any priority list of subject matters for public education. When dealing with this important question, the public must be advised that there is no "black and white" answer to the issue of whether one stays or leaves. They must, however, be given the knowledge which would allow them to make decisions which are as informed as possible. Fire has been described as a "complex, rapidly changing event, which, in its early stages at least, is usually highly ambiguous, providing little positive information to act upon."[25] Dr. John Bryan testified regarding the dilemma of whether to stay or leave. He said:

> "The individual has to make that decision. You have got to give him the best information before the occurrence so he can evaluate that, you have got to provide him with the best information at the time. But he has to make that decision. You can't make it for him,. . .the situation is so dynamic and changing so rapidly, you can't tell everyone what to do and be correct. . ."[26]

Dr. Bryan also testified that stress is at its highest level when people have to reassess their situation after taking action which has had negative results. He also stated that there is a greater likelihood of making improper decisions as stress levels increase. He was asked whether there was a means of increasing the possibility of people taking action which would have positive results, as opposed to negative ones, so as to minimize stress. He replied:

> ". . .essentially it's a matter of making individuals aware of the choices they have, so that they are able to make proper choices. . .the only thing you have to realize is that if he fails in that first commitment,. . .they would get less concerned about personal injury risk, which means that they will then be more prone to taking behaviour that can lead to personal injury and fatality."[27]

His view was supported by representatives of the fire service who appeared at the Inquiry. One of those representatives, Mr. Ronald Bowman, said:

> "Every fire is a different situation, a fluid situation I have heard it described as. If the fire progresses, the decision changes. . .in initial stages of fire, evacuation, quick evacuation, may be your best choice — again, depending on where you are in the building — and of course as the fire progresses, that may be a quick way to kill yourself, getting out of your apartment, so I don't think there is any hard and fast rule. It changes with every situation, in our opinion."[28]

Unfortunately, based on responses by fire departments in Ontario to a questionnaire prepared by Commission staff[29] and a review of various fire safety pamphlets,[30] it became apparent that uniform information regarding this important question is not being given to the public. This is partly due to a difference of opinion regarding the advice occupants should be given.

It is clear that the approach which is widely accepted by the fire service is that the best place to be in a fire is outside the building, and therefore one should evacuate *if possible*. Those who advocate this view believe that occupants should be advised what factors should affect their choice whether to stay or leave, but the general rule should be to evacuate if possible.

On the other hand, at least one fire department in Ontario advises occupants of highrise apartment buildings that they should stay in their apartment until directed to leave by a firefighting officer. In fact, that department instructs occupants that if the fire is in their suite, they should leave their suite, activate the alarm in the corridor, call the fire department from another suite, and "*if necessary*, leave your floor by the nearest exit stairway". Staying on the fire floor is contrary to the generally held view that one should evacuate if possible.

The fire safety information given to the public, including the subject of whether to stay or leave, must be uniform across the Province. This was stressed by a great number of witnesses, including representatives of the fire service. The need for uniformity was also identified in submissions made to the Standing

Committee on the Administration of Justice during their Hearings in June, 1981, which related to the proposed Ontario Fire Code.[31]

If the public is given pre-fire information which will assist them in making informed choices, I believe that the generally held view that one should evacuate if possible is preferable to the view that one should stay unless advised to leave. I have come to this conclusion notwithstanding the fact that people have died outside the room of fire origin during attempts to evacuate. My preference for the generally held view to evacuate if possible has been influenced by a review of the fire at the Inn on the Park in January, 1981. In that fire, fusable links of 135°F fixed temperature heat detectors activated in some guest bedrooms over twenty floors above the fire floor. It seems to me that if one stayed until told to leave or until conditions became untenable, evacuation might be impossible.

Although fire deaths will not be totally eliminated, it is my view that an effective education program should reduce the possibilities of similar fatalities during evacuation.

Effectiveness of Education:

I have recommended a substantial increase in public education regarding fire safety because I believe that through education, human behaviour can be modified, stress can be reduced, and our fire safety record thereby improved.

Dr. Bryan's study of human behaviour in the MGM Grand Hotel compared the actions of guests with fire safety training and guests without such training. He concluded that "there are numerous specific differences but a general difference in pattern of behaviour does not appear to be indicated."[32] The Inquiry was advised that his definition of "prior training" referred to things such as military training. It did not include receipt of prior information from television, radio, movies or periodicals. The residents of apartment buildings who responded to Dr. Cavoukian's questionnaire were asked whether they had received any instruction or information on fire safety devices in their building or what procedure to follow in the event of a fire when they first moved into their highrise building.[33] The hotel guests who responded were asked whether they had read the fire safety instructions in their rooms.[34] In some cases, she concluded that the effect of this prior information appeared to be an increase in people's confidence in their belief that they would know what action to take in the event of a fire. A comparison of their response as to what they would actually do, did not, however, differ significantly.

Although Dr. Bryan did not assess the effect of prior information, as opposed to prior training, on guests' actions, he did report that:

> ". . .of the 139 guests reporting previous information, 119 of these guests, or 85.6% of this population, believed the previous information was helpful to them in this fire incident."[35]

Confidence in one's ability to make the right decision is, in itself, a positive result of education. Dr. Bryan stated:

> "The mere fact that someone thinks that the fire training is helpful, is important in that it reduces their anxiety. . .and gives them options to try."[36]

Notwithstanding the general findings regarding the effect of prior training, and the receipt of prior fire safety information, there is evidence that some behaviour modification occurs as a result of the educational process. For example, study of human behaviour in fires indicates that people will rarely use the elevators. This must be partially, if not wholly, due to the common fire safety instruction, "DO NOT USE ELEVATOR".

The positive effect of fire safety education was most clearly illustrated by the experience of a husband and wife who were guests in the MGM Grand Hotel during the fire discussed in Chapter 4. That couple were reported to have attributed their survival to fire safety information their Grade 1 child brought home from school. Smoke migrated into their room through a space below the door and through a wall vent. They attempted to take action to protect themselves while remaining in the suite, but when they were unable to completely block the wall vent, they attempted to escape through one of two emergency exit stairwells they had noticed prior to the fire. The attempted evacuation was unsuccessful, and they returned to their room where they took further action in attempts to improve the conditions in their guest room.

In the May 1981 edition of the Fire Journal, the experience of this couple is described. The following excerpt illustrates the effectiveness of prior fire safety education:

> "The Brickleys maintained that the fire safety measures they had learned through their son's booklets contributed to their survival.
>
> Robert Brickley says that the material had suggested positive actions that he and his wife could take to help them meet each challenge that the fire presented.
>
> 'We didn't panic because there was always one more thing to try,' says Lina Brickley. She adds, 'This is where the fire safety information is beneficial; it gives you options. We would have had no idea of what to do if we had not reviewed the booklets with our son.'"[37]

Recommendation:

13.11 A study should be conducted to identify methods of education regarding fire safety which will result in people recalling and applying the information received in a fire emergency.

In my view, the effectiveness of any fire safety message will depend, in part, on the means of communicating that message to the public. In addition, I believe it is necessary to note the frequency of fire training and education required in order to have retention of the information conveyed.

Dr. Bryan testified that there are a number of recent studies by the United States Fire Administration, the National Fire Academy, and NFPA, regarding public education techniques and the effectiveness of them relative to retention. It is my recommendation that anyone preparing educational material should refer to the type of sources mentioned by Dr. Bryan. In addition, individuals like Dr. Bryan, Mr. Pauls, and Dr. John Keating, who study human behaviour in fires, should be consulted when preparing this type of material. The use of such expertise is discussed in more detail in Chapter 14.

Subjects for Education:

I have stressed the importance of the public being given pre-fire information which will enable them to make informed choices regarding the action they should take in a fire. Other matters should, of course, also be the subject of the recommended educational program. Some of the topics which should be included in such a program are:

1. The closing of doors is important when leaving the area of fire origin.[38]
2. The public must practice fire prevention. This would involve instilling in the public a respect for fires and should be directed to things such as reducing the careless use of smoking material, the frequent occurrence of grease fires,[39] and increasing the use of fire safety devices such as smoke detectors.
3. "Panic" is very rare.[40]
4. Every highrise building is required by law to have a fire safety plan which includes evacuation procedures.[41]
5. Fire safety should be a cooperative effort and tenants should become involved in improving fire safety in their own buildings.[42]
6. The fire department is *not* automatically notified in every building when the fire alarm is activated. The public should still call the fire department.

In relation to this last matter, the questionnaire prepared by Dr. Ann Cavoukian asked tenants of 15 highrise apartment buildings whether the fire department was automatically notified when the fire alarm sounded. Only one of those apartment buildings had a system which caused the fire department to be automatically notified in such a situation. Notwithstanding that fact, 68.7% of the respondents answered affirmatively that the fire department *was* automatically notified upon the activation of a fire alarm; 8% felt that the fire department was not automatically notified, while 23.4% indicated that they did not know.

The OBC requires all highrise buildings built after 1975 to have a direct connection to the fire department.[43] Unless older buildings which do not have such a system are required to be retrofitted, the majority of the public must be advised that the belief that the fire department is automatically notified upon activation of the fire alarm is mistaken. Hopefully, the serious consequences which can occur because of delayed notification of the fire department will be avoided, if the public knows that the activation of the fire alarm does not, in every case, automatically notify the fire department.

In conveying all of the fire safety information reviewed in this Chapter, it is important that the occupant be made aware of the reasons behind the rules. It is my view that with this kind of understanding there is a greater likelihood that the rules will be followed.

Educational Methods:

Chapter 15 deals with fire safety plans including the requirements for regular fire drills. The preparation of fire safety plans, which must also contain evacuation procedures, is the first step in improving occupant awareness of what to do in a fire. Such plans, which must be prepared on a building-by-building basis, should form the basis of the education given to the occupants regarding their role and responsibilities in a fire. That is a prime reason for my recommendation in Chapter 2 that there be strict enforcement of the OFC's requirement that fire safety plans be prepared by building owners. As discussed, tenants should also be encouraged to ensure their building has an approved fire safety plan and that they become aware of its provisions. This might involve the organization of tenant groups within individual buildings, and appears to be one of the most practical means of conveying fire safety information in various languages.

Although fire safety plans are a means of educating the public, other specific methods of conveying the required messages were recommended by witnesses and in the written briefs received by the Commission.[44] Those methods include short radio and television commercials similar to the construction safety messages prepared through the Workmen's Compensation Board and the Industrial Accident Prevention Association. There were also recommendations for increased use of uniform fire safety pamphlets, fire department lectures, and increased fire safety instruction in schools. I endorse all of those recommendations.

I have personally been very impressed with the construction safety messages I have seen on television and would strongly recommend that television and radio be employed in a similar fashion for fire safety messages.

The Inquiry received a Brief from Fire Prevention Canada Association (FIPRECAN). The organization and its goals were described in the Brief:

> "1. **Organization**
>
> Fire Prevention Canada (Fiprecan) Association is the public education arm of the Canadian fire service. The predecessor organization of Fire Prevention Canada was the Joint Fire Prevention Publicity Committee, established in 1959 and subsequently dissolved in 1976 with the incorporation of Fire Prevention Canada.
>
> Co-sponsored by the Association of Canadian Fire Marshals and Fire Commissioners and the Canadian Association of Fire Chiefs, Fiprecan, a not-for-profit Corporation was incorporated by Letters Patent in 1976. . .The property and business of the corporation are managed by a Board of Directors and a full-time office staff. The Association's head office is located in Ottawa, Canada's Capital.
>
> The Association is charged with the responsibility of developing and distributing fire prevention materials and related media services in Canada. Fiprecan annually prepares and distributes a catalogue of fire prevention materials. Over 10,000 copies of the catalogue are printed and mailed to all Canadian fire departments, all hospitals and many other organizations, both public and private, in all the Provinces and Territories in addition to numerous fire departments in the United States.
>
> As Canada's major supplier of fire prevention materials, both printed and audiovisual, each year well in excess of one thousand (1000) organizations favor the Association with orders for fire prevention materials and other services. The sale of fire prevention materials including booklets and pamphlets and audio-visual presentations reaches into the millions of items. The fire safety subjects addressed range from burn prevention to Christmas fire safety to high rise fire safety, etc..
>
> The Association continually maintains a large stock of fire prevention materials to meet current needs. . .
>
> **Conclusion**
>
> Public Fire Safety Education is a systematic attempt to disseminate information on various aspects of fire prevention and survival. Efforts in allerting the public to the hazards associated with fire must be continual, factual and positive. Broad public awareness, behaviour-oriented programs can

> greatly contribute to a fire safe environment by instructing members of the public — small children, big children, adults, senior citizens, institutional and business management, engineers, architects, school teachers, municipal management, the police, the courts, the politicians — about fire causes, early detection and how to respond once a fire has started.
>
> Fire Prevention Canada's programs are totally supportive of the public education efforts of fire departments and other concerned individuals and organizations.
>
> As the issue of EDUCATION is being addressed by the Public Inquiry, in his final Report the Commissioner, Judge John B. Webber, may consider the fire safety public education programs already in place and directed to people who live, work, and play in high buildings to be adequate and satisfactory.
>
> But, if recommendations on the issue of EDUCATION do result in Judge Webber's Report, this Association due to its stature, its experience and expertise and its contacts with Ontario fire departments would be more than pleased to involve itself in and cooperate with those agencies of the Ontario Government which may be assigned the responsibilities of implementing the recommendations.
>
> It is our belief that Fiprecan's involvement could result in the more effective and efficient development and promotion of public education fire safety programs and at lower costs."[45]

I encourage the OFM and other provincial agencies which become involved in fire safety education to take advantage of Fiprecan's offer of assistance.

Many of the fire safety problems which I have referred to, and which must be addressed in order to improve life safety in highrise buildings, are problems which are not peculiar to highrise buildings. For example, the careless use of smoking materials is a source of ignition in both lowrise and highrise buildings. Any educational effort to improve that situation would not be directed solely at those who use highrise buildings. The recommended educational program will, therefore, be relevant to all members of society and have a positive effect on the Province's overall fire record. This fact must not be ignored when deciding whether an increased expenditure of funds for public education is justified. I find support for this conclusion in the evidence of Mr. Donal Baird.

> "More and more, fire authorities are becoming aware that the fire problem is predominantly one of human behaviour. I feel that it is not possible to separate the highrise problem entirely from the general picture of fire risk, or to make people fire safety conscious in this area alone. I believe very strongly that we can deal effectively with any of the individual areas of the fire loss problem satisfactorily only by improving the whole fire system, with emphasis on the common denominator of human behaviour."[46]

National Approach to Fire Safety Education:

The quotation which appears at the beginning of this Chapter, and which emphasizes the need for education for all members of society, was taken from "The Study on Fire Prevention and Control Systems in Canada" (Exhibit 84). Because its Terms of Reference required an examination of the topic nationwide, its recommendations regarding further education were not limited to any one province. In fact, it was the authors' opinion that to be most effective, the fire problem should be addressed as a national problem. In that regard, the report recommended the establishment of a Canadian Fire Council. The report states:

> "NRC should convoke a congress of provincial government delegates made up of the provincial minister responsible for fire protection in each province and territory, or his deputy minister, to consider the Report and the recommendation that a Canada-wide representative Fire Council be established. This Council should represent all important segments and interests in the fire control field for the purpose of coordinating a concerted fire control effort in Canada. The congress, representing the appropriate legislative jurisdictions and other appropriate interests, should be asked to consider the suitability of establishing a Canada Fire Council. It is vital to have willing acceptance by the provinces and territories as well as support of all other elements in the field of public fire protection."[47]

It is my view that a national approach to fire safety would be beneficial. Regardless of the form any national organization might take, such body should have as its main objective the "coordination of a concerted fire control effort in Canada."

[1] Switzer and Baird, *Study on Fire Prevention and Control Systems in Canada*, 1980, p. 84.

[2] *Ibid.* p. 100.

[3] Brief 45, p. 8.

[4] OBC Section 2.11.

[5] Transcript, Volume 60, p. 14.

[6] OBC Section 2.4.

[7] Transcript, Volume 51, p. 86.

[8] Brief 65, p. 4.

[9] Keating, *The Myth of Panic*, p. 61.

[10] Exhibit 24, p. 98.

[11] Transcript, Volume 32, p. 33.

[12] Transcript, Volume 33, pp. 52 to 53.

[13] Transcript, Volume 40, p. 34.

[14] Transcript, Volume 56, pp. 42 to 47.

[15] Transcript, Volume 56, p. 57.

[16] *Fire Marshals Act*, R.S.O. 1980, c.166, s. 3(d) and (e).

[17] Exhibit 260; for an example of a course offered privately see Exhibit 47.

[18] Transcript, Volume 34, pp. 19 to 24; Exhibit 167.

[19] Transcript, Volume 33, p. 133.

[20] Exhibit 304.

[21] See Chapter 8 under the heading, "Fire Alarm Systems".

[22] Exhibit 25.

[23] Transcript, Volume 31, p. 82.

[24] Exhibits 185 and 144.

[25] Cantor, *Fires and Human Behaviour*, p. 117.

[26] Transcript, Volume 40, p. 101.

[27] Transcript, Volume 40, p. 54.

[28] Transcript, Volume 59, p. 53.

[29] Exhibits 179 and 180.

[30] Exhibits 44, 48, 49, 190 and 229.

[31] Exhibit 64.

[32] Exhibit 183, p. 70, Conclusion #19.

[33] Exhibit 185, pp. 33 to 34.

[34] Exhibit 185, p. 47.

[35] Exhibit 183, p. 66.

[36] Transcript, Volume 40, p. 62; to the same effect see Schwalm, *The Effect of Attitudes and Experience on Human Behaviour in Fires*.

[37] Exhibit 63.

[38] See above under the heading "Stay or Leave".

[39] In OHC apartment buildings between 1975 and 1981, between 23% and 36% of all fires in each year originated in the kitchen; Exhibit 159.

[40] This topic is dealt with in Chapter 14.

[41] This topic is dealt with in Chapter 15.

[42] See above under the Recommendation 13.10.

[43] OBC Clause 3.2.6.8(2)(d).

[44] Briefs that speak to this issue are: 23, 27, 33, 39, 45, 49, 51, 52, 69 and 83.

[45] Brief 69, pp. 1 & 7.

[46] Transcript, Volume 33, p. 61.

[47] Switzer and Baird, *The Study on Fire Prevention and Control Systems in Canada*, 1980, p. 104, Recommendation #3.

Chapter 14

Implications of Human Factors on Code Writing, Fire Safety Plans and Public Education

HUMAN BEHAVIOUR

Portions of the preceding Chapters have relied on available information about human behaviour to justify certain comments and recommendations. Human behaviour in some actual fires has been reviewed in Chapters 3 through 6. Notwithstanding these discussions I have decided that the topic of human behaviour in fires is of such importance that it should be the subject matter of a separate Chapter within this report.

Recommendation:

14.1 ***There should be an increased involvement of experts in human behaviour in the code writing process, and that involvement should be formalized in a manner similar to the procedure adopted for the NFPA Life Safety Code. In addition, there should be input into the preparation of guidelines for fire safety plans and educational material by social scientists.***

During the Inquiry, it became evident to me that when considering fire safety, one should be careful not to concentrate solely on the technical aspects of fire safety. A consideration of the human factors and how the individual reacts to a changed environment caused by fire is just as important.

Provisions in building codes prescribing certain design requirements are based on assumptions about human behaviour. For example, code requirements for the design of exit stairwells are based on assumptions about how people will move within the stairwell, and the rate at which people enter the stairwell from various levels. Code requirements prescribing certain types of exit signs and the location of those signs assume that compliance with the Code will draw the occupants' attention to the sign and that the sign will convey some useful information.

Fire safety plans, and in particular their provisions regarding evacuation, fire drills, and the assigning of responsibilities to supervisory staff, are based on assumptions about how people will behave in an emergency situation. In assigning responsibilities to designated persons, assumptions are made that in emergency situations those persons will perform their duties and that their instructions will be followed. In the case of fire drills, assumptions are made that "practice will make perfect."

One source of knowledge about human behaviour in fires are the reports prepared by professionals who study individual fires, and concentrate on the human elements in those fires. Dr. John Bryan's study report "An Examination and Analysis of the Dynamics of the Human Behavior in the MGM Grand Hotel Fire" is an example.[1]

By employing a scientific approach to collecting information about human behaviour in specific fires, Dr. Bryan and other "students of human behaviour" have been able to identify certain recurring behaviour patterns of people in fires.

Dr. John Bryan testified that he was asked to join the Life Safety Committee of NFPA 101 in 1974 because that committee "wanted to have input from people who were social scientists, more than physical scientists, to attempt to address and move this information [regarding human behaviour] into the Code." There has been no similar development in Canada, and in my opinion an increased involvement of experts in human behaviour in the code writing process is desirable.

The Inquiry was given numerous examples of how the study of human behaviour in fires has demonstrated the need to reassess longstanding assumptions about how people behave in emergencies, and has identified problems which might not otherwise have been discovered. Throughout the report, I have referred to the results of such studies where it has been relevant to the various subjects discussed. In the next part of this Chapter, I will briefly describe research methods employed by social scientists and some conclusions which have been drawn from their studies. I will also briefly comment on the actual or possible implications of those conclusions.

It seems to me that only by researching actual behaviour in fires, can we hope to improve our ability to predict human behaviour in fires, and respond to it effectively in codes, fire safety plans, and educational materials. It is hoped that the following general description of what the social scientists do will impress upon the reader, as it did upon me, the valuable contribution to fire safety that this type of research can provide.

Research Methods:

The research by social scientists has been directed to the determination of what people will do in a fire emergency. Various researchers have developed conceptual or theoretical models from observed or reported human behaviour. The purpose of developing models is to predict human behaviour in future fires. Having reliable predictions about human behaviour assists code writers to reassess the assumptions upon which codes have been drafted and to amend them where necessary. They also provide the basis for an evaluation of fire planning and educational material.

The researchers concluded that human behaviour was altered or influenced by four factors: the building itself; firefighting hardware; people; and peoples' training.

They also recognized that:

> ". . .behaviour in fires can be understood as a logical attempt to deal with a complex, rapidly changing situation in which minimal information for action is available."[2]

Dr. John Bryan's study of the human behaviour in the MGM Grand Hotel fire is an example of the way in which social scientists go about the actual study of human behaviour.

He categorized the actions of the participants into "behaviour response patterns", which is an approach commonly used by social scientists.

For example, "evacuation" was considered to be a behaviour response pattern. Within that category the action taken by occupants of the building could vary and included actions such as "left building", "got family", "got personal property", "went to balcony". The behaviour response pattern of "firefighting" included actions such as "got extinguisher", "attempt extinguishment", "removed fuel." Protective procedures, actions of alerting others, and investigation of cues that there was a fire, are other behaviour response patterns identified by Dr. Bryan.[3]

The behaviour response patterns may differ for each researcher or each separate study, but the purpose of the categorization is always the same.

Dr. John Bryan, in commenting on the purpose of identifying behaviour response patterns from his study of residential fires (Project People) and fires in health care occupancies (Project People II) said:

> "The identification of behavior response patterns. . .provides the mechanism to enable. . .analysis and comparison of the behavior response pattern to the empirical and conceptual concepts of. . .current behavior models."[4]

In other words, current behaviour models tell researchers to expect certain kinds of behaviour. Researchers then choose specific kinds of behaviour (behaviour response patterns) and observe whether and how often a particular behaviour response pattern happens. This allows them to test the model, or the expected behaviour, against what actually happens.

INFORMATION GAINED FROM STUDY OF HUMAN BEHAVIOUR

The following are some findings from studies of human behaviour during fires, and comments on their possible implications for code writing and preparation of guidelines for fire safety plans and educational materials.

Panic:

With the minimal information they have, people in fire attempt to logically resolve the dilemma that confronts them; *they do not panic*.

The literature on fire safety, including educational pamphlets, has often referred to "panic". It is not uncommon to find educational pamphlets which instruct people "DO NOT PANIC." When a fire occurs with resulting injuries or death, the media often attributes such injury or death to panic. Some witnesses before the Inquiry used the term "panic" to describe their own reaction to fire.[5] As discussed below, "panic" is almost invariably an inaccurate description of the occupants' behaviour. Unfortunately, the improper use of the term "panic" to describe human behaviour in fires, creates a myth that people do in fact behave in this fashion. This myth must be ended.

A distinction between true panic and actual behaviour in fires must be made clear. Dr. John Bryan testified that the classic definition of panic as contained in psychological literature is "flight behaviour from a real or perceived danger involving competitive behaviour resulting in injury to oneself or others."[6]

Panic has also been defined as non-adaptive or irrational behaviour. Dr. John Keating, of the University of Washington (Seattle), in his article, "The Myth of Panic", identifies four elements as being essential before any behaviour in a fire situation should be called "panic behaviour." First, people display a hope to escape, and perceive that their avenues of escape are dwindling. Second, there must be some kind of contagious behaviour. Third, each person becomes aggressively concerned about his own safety as opposed to concern for other people who are also in the fire. Finally, and most important, there must be irrational, illogical types of responses.[7]

The study of human behaviour in fires has demonstrated that panic as defined above is extremely rare. Fire is, "a complex, rapidly changing event, which, in its early stages at least, is usually highly ambiguous, providing little positive information to act upon."[8] The evidence is that with the minimal information they have, people in fires attempt to logically resolve the dilemma which confronts them. They do not panic.

For example, in his report based on the analysis of behaviour response patterns in approximately 335 fires (mostly residential), and 59 fires in health care occupancies, Dr. Bryan states:

> "The conclusions and results. . .indicated the stereotyped accounts of individuals panicking and competing for escape from the fire incidents buildings, did not occur within these primarily residential and health care occupancy study populations. Examples of altruistic behavior, involving the notification of others of the incident, evacuation assistance to others, reentry into the fire incident structure to assist others were documented."[9]

The belief that people panic is partly the result of people involved in fires reporting that they "panicked." Studies conducted by researchers of human behaviour in fires indicate that people do, in fact, improperly describe their actions as being motivated by panic. In commenting on the description by people of their own behaviour in fires situations, Dr. Bryan's report states:

> ". . .individuals were encountered that described their own behavior in terms of panic. However, when one examined the behaviour of the participants, it was determined that they had adopted behavioral responses that were logical, rational, functional and usually most effective to the environmental situation of the fire incident. Thus, the individuals themselves, when further questioned, recognized they were describing their emotional feelings of anxiety and concern which they described as panic, but the overt actions and behavior were not of the panic type behavior."[10]

Dr. John Bryan related the facts of a hospital fire in which a nurse, upon hearing the alarm, went to the area of the fire, asked others whether evacuation procedures had commenced, and went to a nursery closest to the area of fire origin to make sure all the infants had been removed. She reported that she "panicked." The evidence clearly demonstrated that she acted in an adaptive and positive manner. Dr. Bryan stated that in using the word "panic", this nurse was describing an increase in her anxiety or stress, something which is to be expected in such situations, but which is quite different from panic.

Junie Boudreau, a tenant of a highrise apartment building in Toronto, described her experience in a fire as one which involved her "panicking." She was in her apartment when a fire occurred in another part of the building. When the fire alarm sounded, she was unable to leave her apartment due to smoke in the hallway. She received instructions from a firefighter to stay in her apartment, which she did. As her apartment had a balcony, she went to that balcony. She continued to move in and out of the apartment from the balcony to assess the situation. She did not pack her bags or attempt to leave the apartment. She used her telephone to try and obtain information. Her entire action was one of seeking information so that she could act in accordance with her own assessment as to what would be best for her. It would be inaccurate to describe her actions as "panic."

I have dealt with the topic of panic at some length, because in my opinion, when describing the action of people involved in a fire, it is important to distinguish between true panic and the rational response of being afraid when threatened. Dr. John Keating explained why the failure to draw this distinction is detrimental. He says that:

> "Stating that people "panic" during fires, provides an easy excuse. The implications are simple — people flunked the survival test of the fire. A further implication regarding panic is even worse. It can instill a pessimistic attitude that the situation cannot be changed, since such a panic response must be primordial, and that attempts to modify such a basic part of human behavior during emergencies, are futile."[11]

Movement Through Smoke:

In the MGM Grand Hotel Fire; approximately 75% of the study population moved through smoke during their evacuation, some of them moving through smoke with zero visibility. The most utilized means of egress were the stairs (78% of the study population). Guests reported being trapped in several stairwells due to heat and smoke, and being unable to leave the stairs due to the stairwell doors being locked from the inside. In one of the smoke-filled stairwells, guests reported that approximately 50 people were trapped prior to the opening of the roof access door from the stairwell.

These findings have implications for code writing and public education. The fact that people will use the stairwell as a means of evacuation and will move through smoke in order to do so, is an indication that locking stairwell doors from the inside can have disasterous results. A need to reconsider code provisions which allow stairwell doors to be locked in this fashion is apparent.

A further implication is that the public must be advised of the risks involved in moving through smoke so that any decision to move through smoke will be as informed as possible.

Contagion:

"Contagion" is a term used by Dr. John Keating to describe the human response in many fires of following the lead of someone else — particularly where the situation is ambiguous and people doubt their own judgment abilities and search for the best source of information available.

Using a hotel fire as an example, Dr. Keating states that "if a hotel's guests are told how they should behave in a fire situation, those individuals with leadership capacity should be able to lead an entire group to safety. A type of positive contagion will prevail."[12]

One implication of this observation is that small turnouts at meetings to discuss fire safety, and the apparent apathy of many to fire safety in general, should not result in there being minimal efforts towards educating the public. If you get the message to the one individual with leadership capacity, and that person is involved in a fire, you may have effectively reached and assisted a much larger number of people.

Exit Signs:

The study of human behaviour in a large number of fires has indicated that exit signs may not be as useful as intended. Dr. Bryan's analysis of human behaviour in fires in residential and health care occupancies (Project People and Project People II, respectively), and one public assembly occupancy, led him to conclude that, "in all three studies, only a very small portion of the participants, between 6 and 8% of the total participant populations, indicated they noticed or observed the exit signs."

In my view, the clear implication of these findings is that code provisions which stipulate the location, colour and design of exit signs and lights, should be reconsidered. The fact that smoke affects the illumination of lights at ceiling level more so than at floor level might be the basis of considering floor level illumination to increase the effectiveness of lighting in smokey conditions.

Information Seeking:

At the MGM Grand Hotel Fire, approximately 46% of the study population (253 of 554) sought information about the fire by turning on their televisions and radios. Dr. Bryan testified that the study population in the MGM Grand Hotel Fire,

> ". . .were very critical of the media and that all they got was information that increased their anxiety level and such information that the fire was going on, the number of casualties and no information that they needed as to the location of the fire, as to how long they could expect to have to wait for rescue, [or] what was being done to rescue them. . ."[13]

It was Dr. Bryan's view that the behaviour of the occupants of the building, in turning to radio and television for information, is a cue to the fire service in their pre-fire planning to include the media as a means of providing information to the people in the building at the time of the fire.

In describing a person in a fire situation, Dr. Bryan stated:

> "There is nothing worse than knowing something is going on but you don't now what. . .it is a very uncomfortable situation. . .very high anxiety level, until you define just what are the dynamics going on in that situation. . .the question people always ask when they see fire apparatus or hear fire apparatus is. . .'where is the fire?'"[14]

In relation to wanting to know where the fire is Dr. Bryan testified:

> "It's really the life saving information that you need to know, and if you know that, you at least are better able to make your evaluation and committment effectively."[15]

It is my view that this observation about information-seeking by building occupants also stresses the importance of providing information during the fire situation which is accurate and conveyed in a calm, dispassionate manner. If an occupant is experiencing heightened anxiety and stress, imposing additional stress by delivering an unclear message is to be avoided. I agree with the submission of Commission Counsel that knowledge that people will seek information during a fire situation in the manner described is something which should be brought to the attention of the broadcast media. I agree with his submission that if the media were aware of the significance that their message can have *during* a fire, they would want to ensure that their messages were not creating problems for the people caught in the fire by frightening them unnecessarily, giving them improper information regarding the location or size of the fire, or by exaggerating the seriousness of the fire.

For all the above reasons, I believe that the following recommendation addressed to the broadcast media is warranted:

Recommendation:

14.2 The fact that occupants seek information from radio and television during fires should be brought to the attention of the Canadian Association of Broadcasters and the Radio and Television News Directors Association. Members of these associations should meet with the fire service and voluntarily modify their procedures during fire situations in light of what is being learned about human behaviour in fires.

This observation about information seeking also indicates a need for voice communication and illustrates the type of information that occupants desire.

I have described some findings resulting from the study of human behaviour to illustrate the importance that knowledge of human behaviour can have when writing codes, and preparing fire safety plans and material for public education. Other important observations of human behaviour in fires which were the subject of evidence before the Inquiry included "convergence clusters", "seeking areas of refuge", "adaptive and altruistic acts", "first aid firefighting", and "the effects of the presence of authority figures".

HANDICAPPED

In this report, the term "handicapped" or "disabled" are used interchangeably and describe persons who have disabilities which limit the behaviour they can engage in during a fire, or which have an impact on the effectiveness of the action they are capable of taking. The terms refer to the physically disabled, including sight and hearing impaired.[16]

Part 5 of the OBC contains building requirements for handicapped persons. The term "handicapped persons" in the OBC means persons in wheelchairs. Part 5 deals primarily with ways to provide access and entry for these handicapped persons. It does not, at the present time, provide for the egress of these handicapped persons in an emergency situation, nor does it provide for building features which would assist persons with handicaps such as deafness or blindness.

The evidence revealed that the handicapped are not seeking numerous specific building code "provisions" which would be useful to them only. Byron Johnson, a researcher with the Rehabilitation Institute of Ottawa, has worked with the handicapped for many years. In his brief, he made the following comment:

> "Disabled persons have three basic concerns about fire safety in highrise buildings. The first is that the risk of fire should not be used as an excuse to exclude them from living, working or entertaining themselves at any height in a building. The second concern is that the risk to them should not be substantially greater than the risk to others. The third concern is that the difficulties they may have in a life threatening situation ought to

be considered in both the design and the management of the building. We, at the Rehabilitation Institute, believe that any difficulties of emergency evacuation faced by disabled persons can be easily and inexpensively overcome without jeopardizing the fire safety of everyone, including disabled persons. We do not believe that either the difficulties experienced by some disabled persons or the risk of fire or other emergency in any way justify excluding disabled persons from the use of any building, whatever the floor level."[17]

Recommendation:

14.3 Present code provisions should be assessed to determine if changes could be made which would increase the benefit to the handicapped without reducing the level of safety afforded to the able-bodied.

Recommendation:

14.4 The Ontario Fire Marshal should contact the CNIB and request that organization's involvement in the preparation of fire safety pamphlets in braille and tape recorded information.

Mr. Euclid Herie, the Executive Director of the CNIB, appeared on behalf of the 15,000 registered blind, and up to 100,000 estimated visually impaired persons in Ontario. Mr. Herie has been actively involved in promoting amendments to the OBC which would be of benefit to the disabled. He also discussed certain changes that have been proposed for the 1985 edition of the NBC.[18] Mr. Herie, who is blind, travels extensively in connection with his duties with the CNIB, and was able to comment with some authority as to the amount of information available to him in highrise hotels.

Mr. Herie was of the opinion that when considering building modifications necessary to assist handicapped persons, excessive cost must be avoided, and solutions must be practical. He provided the Inquiry with a booklet entitled, "Environmental Modifications for the Visually Impaired", which contains comments and suggestions that would be extremely useful to code writers when dealing with the needs and requirements of the visually impaired when assessing code requirements for construction and renovation (Exhibit 270).

The issue of possible building modifications which could be of benefit to persons with disabilities, was discussed in a number of briefs. Some specific suggestions were the use of flashing exit signs, relocation of alarm bells over exit doors, raised or tactile indicators of floor numbers on stairwell doors. Early warning, including voice communication, is even more important where there may be difficulty evacuating. The point was made that these aids would be of assistance to able-bodied persons as well, as almost anyone could suffer disorientation or other difficulties in an emergency situation.

In his evidence, Byron Johnson indicated that evacuation of disabled persons by stairs is always difficult and never practical. This difficulty was recognized by most persons who discussed this issue. They suggested an increased reliance on planning, on areas of refuge and on the development of elevator use for the evacuation of the disabled. While certain members of the fire service or the public suggested that disabled persons should not live, or perhaps work, on certain levels in high buildings, disabled persons themselves and their advocates object strenously to imposing limitations of this sort on people. It is necessary for disabled people to live somewhere and work somewhere everyday. It seems unwarranted to impose additional limitations in response to what is in fact a fairly remote danger and one that can be addressed through planning, proper building design and education.

Mr. Herie commented that he has never been given any information in any hotel as to the safety services available. He is not aware of any braille handout available to visually impaired persons, although he commented that handouts are provided by the airlines. He added that the CNIB is prepared to assist in the preparation of such materials. As the Hotel Fire Safety Services Unit is presently preparing pamphlets for use in hotels, it appears to me that this would be an excellent opportunity to provide information, such as that described by Mr. Herie, in hotels with little delay.

Discussion of other important aspects of life safety for disabled persons is found in Chapters 8, 12 and 15.

This discussion of human factors has dealt with human behaviour in fires, the validity of certain beliefs regarding human behaviour and the relationship of the handicapped to highrise buildings. The improvement of physical and mechanical devices are important, but people must also be assisted more directly. The OFC requires fire safety plans to include provisions which will assist people in fire emergencies. Fire safety plans are discussed in detail in the following Chapter.

[1] Bryan, Dr. John L. *An Examination and Analysis of The Dynamics of the Human Behavior in the MGM Grand Hotel Fire*, National Fire Protection Association (Revised Edition, April 1983).

[2] Pauls and Jones, *Research in Human Behavior*, Fire Journal Vol. 74, No. 3, May 1980, p. 35.

[3] Bryan, Dr. John L. *Implications for Codes and Behavior Models from the Analysis of Behavior Response Patterns in Fire Situations as Selected from the Project People and Project People II Study Programs*, College of Engineering, University of Maryland. College Park, 1982.

[4] *Ibid*., p. 114.

[5] i.e. Junie Boudreau, Transcript, Volume 58, p. 9.

[6] Transcript, Volume 40, p. 15.

[7] Keating, Dr. John *The Myth of Panic*, Fire Journal, May 1982.

[8] Canter, David ed., *Fires and Human Behaviour*, p. 117.

[9] Bryan, Dr. John *Implications for Codes and Behavior Models from the Analysis of Behavior Response Patterns in Fire Situations as Selected from the Project People and Project People II Study Programs*, 1982, p. 199.

[10] *Ibid*., p. 141.

[11] Keating, Dr. John *The Myth of Panic*, p. 57.

[12] *Ibid*., p. 60.

[13] Transcript, Volume 40, p. 37.

[14] Transcript, Volume 40, p. 59.

[15] Transcript, Volume 40, p. 60.

[16] Some briefs speaking to this issue were: 48, 58, 61, 74, 76.

[17] Brief 61, p. 2.

[18] Exhibit 269.

Chapter 15

Fire Safety Plans and Egress

FIRE SAFETY PLANS

In preceding chapters I have discussed the fire record and the fire service, described actual highrise fires, made recommendations for the improvement of the physical characteristics of existing and new highrise buildings, and discussed the need for clarification of the relevant legislation. I have also commented on the need for education and for understanding of human behaviour in fire emergencies. Many of these topics as they relate to highrise buildings are dealt with in fire safety plans designed for each building.

The requirement for fire safety plans in apartments, offices and institutions is found in Section 2.8 of the Ontario Fire Code. That section describes the buildings which must have a fire safety plan, and what those plans must contain.

Hotels have been required to have "evacuation plans" since 1971. It must be clearly understood that fire safety planning means much more than simply the establishment of evacuation procedures. The proposed amendments to the HFSA will require hotels to have the type of fire safety plans contemplated by the Ontario Fire Code.[1]

Signs posted giving instructions to be followed "IN CASE OF FIRE" are useful, but they do not fulfill the requirements for a fire safety plan. A complete fire safety plan will include among other things provisions for maintenance, and for appointment and training of supervisory staff.

Institutions have had fire safety plans that are comparable to the plans required by Section 2.8 of the Ontario Fire Code for many years. These plans have been based on guidelines prepared by the Office of the Fire Marshal.

Further guidance for the preparation of fire safety plans in highrise apartment buildings can be found in the new publication entitled "Guidelines for Preparation of Fire Safety Plans for Residential Buildings" which was produced by the Ministry of the Solicitor General, Office of the Fire Marshal, in April of 1983 (Exhibit 286).

With appropriate modifications for hotels, the recommendations in this Chapter regarding fire safety plans apply to *all* highrise buildings.

The requirements to prepare fire safety plans, and hotel evacuation plans, are in force *now*, and it is obvious to me that, while efforts are being made by some to comply with the legislation, a great deal of work is yet to be done.

In my view, proper fire safety planning will clearly reduce fire related deaths and injuries. This will happen for four reasons: First, proper maintenance of building systems and education of occupants should reduce the number of fire incidents. Second, in case of fire, building systems that have been properly maintained will function properly. Third, supervisory staff will be aware of the actions they must take, which will result in prompt notification of the fire department, identification of the location of the fire, use of voice communication, orderly evacuation and the giving of assistance to those who need it. Finally, building occupants will be aware of the proper procedures and the choices they can and must make.

One of the beneficial effects of an emphasis on fire safety planning will be an increased awareness of fire safety which should improve the fire record. In my view, if management and occupants of highrise buildings become actively involved in the preparation and implementation of fire safety plans, the fire safety plan will provide the *most cost effective* and *prompt* way to resolve many existing problems.

Recommendation:

15.1 Article 2.8.2.7 of the Ontario Fire Code which requires a minimum of one copy of the fire safety plan to be permanently posted and maintained on each floor area should be amended. The section should only require the posting of emergency procedures to be used in case of fire including sounding the fire alarm, notifying the fire department, instructing occupants on procedures to be followed when the fire alarm sounds, and the procedures for evacuation of those in need of assistance.

As presently worded, Article 2.8.2.7 of the OFC requires posting of the entire fire safety plan on every floor. The bulk of any fire safety plan will be directed primarily to supervisory staff and maintenance staff and will not concern other occupants of the building. Posting of the entire plan is therefore unnecessary and impractical. Mr. Roy Philippe testified that, in his view, it was not the intention of the OFC to require posting of the entire fire safety plan. I would suggest, however, that copies of the entire fire safety plan should be made available to occupants on request. A note to this effect should be added to the emergency procedures that are posted.

Requirement to have a Fire Safety Plan:

Recommendation:

15.2 The Ontario Fire Code should be amended to clarify the the application of Article 2.8.1.1. It should unambiguously require all highrise buildings to have a fire safety plan regardless of their date of construction or whether they presently have a fire alarm system.

Section 2.8 of the OFC provides for emergency planning, including the requirement to have a fire safety plan. Article 2.8.1.1 states:

> The requirements of this Section apply to every building containing a Group A or B occupancy, and to every building required by the Building Code to have a fire alarm system.

Questionnaires prepared by the Inquiry staff and distributed to Chief Fire Officials in the Province (Exhibit 179, Exhibit A), and to building owners and managers (Exhibit 187, Appendix A) asked whether Section 2.8 of the OFC required *all* highrise buildings, regardless of their date of construction, to have a fire safety plan. The answers illustrated that the scope of the Section is unclear. For example, the response of 13.5% of the Chief Fire Officials was that Section 2.8 of the OFC did not apply to all highrise buildings. The Chief Fire Official in Brockville believes the section applies to buildings containing Group A or B occupancies regardless of construction date, but the only other buildings included are those which were or will be constructed pursuant to the requirements of the OBC where the OBC requires that building to have a fire alarm system. The Chief Fire Official in Thunder Bay interprets this section to require only Group A and B occupancies which have been constructed since the OFC came into force in November 1981 to submit fire safety plans for approval. The response from Stoney Creek indicated that a building must have a fire alarm system before Section 2.8 would require a fire safety plan.

The responses by building owners and managers also indicated that the scope of Article 2.8.1.1 is not clear. One respondent replied that "Group C Occupancies", which includes apartment buildings, are not covered by this section. George Coleman of Metro Housing Company Limited testified that he interpreted Article 2.8.1.1 in the same fashion.

In my view, the intent of Section 2.8 is not clear and the confusion is understandable. The confusion is compounded by the requirement for fire safety plans to be "maintained at the central alarm and control facility", because highrise buildings constructed prior to the enactment of the OBC in 1975 may not have a central alarm and control facility.

Chief Wretham, President of the Ontario Association of Fire Chiefs, and Roy Philippe, testified that they interpreted Section 2.8 of the OFC to require *all* highrise buildings to have a fire safety plan. The Fire Marshal agrees with this interpretation and when he was advised of the responses made by the Chief Fire Officials to the questionnaire, he testified that the confusion caused him concern. In his view, the confusion can be overcome through dialogue with Chief Fire Officials and without legislative amendment. It is my opinion that the meaning of Section 2.8 is open to doubt, and that such a basic provision of the OFC should be clear and unambiguous. I have therefore recommended that the Section be amended.

If there is any merit in the belief that a building must have a fire alarm system before a fire safety plan is required pursuant to Section 2.8, it is a situation which is easily rectified. In Recommendation 10.8, I have recommended that all highrise buildings should have a fire alarm system.

Timing:

Recommendation:

15.3 The Ontario Fire Code requirement that fire safety plans be prepared for all high buildings should be enforced.

Recommendation:

15.4 Chief Fire Officials should make all reasonable efforts to ensure that the review and approval of fire safety plans which have been prepared by building owners and submitted to them for approval is given high priority.

The OFC requirement to have fire safety plans is effective as of the date the OFC came into force. Chief Fire Officials did not, of course, require immediate compliance with this requirement by the owners of existing buildings, as that would have been impossible.

The responses to the questionnaire sent to Chief Fire Officials indicated that very few fire safety plans required by the OFC have been prepared and submitted to them for approval.[2] Based on an analysis of responses to this questionnaire, 60% indicated a ratio of plans to buildings of 10% or less, 22.5% indicated a ratio of 11% to 49%, and 17.5% indicated a ratio of 50% or over. I was surprised, upon reviewing the comments included in the questionnaire to discover that some Chief Fire Officials are uncertain as to what a fire safety plan is.[3]

Representatives of the apartment and office industry testified that fire departments have given them the impression that fire safety plans are not a high priority matter at the present time. Mr. Tatham, a witness on behalf of BOMA, believed the fire departments were not approving fire safety plans because they were waiting for the report of this Inquiry. Mr. Sadowski of UDI testified that building operators "are not clear on any part" of the Ontario Fire Code. He stated:

> "The problem is that. . .part of the Act was enacted and part of the Act was not and there seemed to be a feeling in the industry that came through loud and clear in my opinion that this Act is sort of under suspension, there's going to be a Commission into hearing about the whole thing and when that is settled and cleared away, then we'll get on with the business of worrying about training, equipment, retrofit and — so on and so forth."

While this evidence could be considered somewhat flattering, as the recommendation states, the preparation of fire safety plans should be done immediately.

The view of the apartment and office industry that the preparation of fire safety plans has not been treated as a high priority matter is, in my opinion, justified. Chief Wretham of Scarborough testified that his fire department will accept fire safety plans but they are "not soliciting them heavily". The reason for this situation may lie in the evidence of the Fire Marshal. Mr. Bateman was questioned about the small number of fire departments which sent a form letter to all building owners advising them of their responsibility to prepare fire safety plans. He commented:

> ". . .I would have thought more [fire departments] would have picked up on it [sent information out], but at the same time I'm sure that we told them during these seminars and so on, that we've held, [soon after OFC was filed] that we would be back to them with more specific documentation, so they may have been waiting for us."[4]

It appears that the fire departments have been awaiting guidelines from the Office of the Fire Marshal. I cannot criticize the OFM for the rate at which they have been producing guidelines for the preparation of fire safety plans. It is my impression that the OFM is responding to the need for such guidelines as best it can in light of present Government restraints on funding and staff.

To have prosecuted owners for failure to prepare fire safety plans before this time would have been questionable. As of February 15, 1983 no fire safety plans for buildings owned by the Government of Ontario had been submitted to Chief Fire Officials for approval. The Inquiry was advised that the plans for these Government buildings were to be filed by April 1, 1983.[5]

It is my opinion that sufficient time to prepare a fire safety plan has now passed and this requirement of the OFC should be vigorously enforced.[6] Notwithstanding the lack of guidelines, it is my view that owners of many highrise buildings had the capacity to prepare fire safety plans prior to this point in time. In the case of hotels, there have been requirements for evacuation plans since 1971.

If fire safety plans are prepared and submitted for approval as recommended, Chief Fire Officials will be faced with a monumental task of approving them. I can appreciate that with limited staff and funding, the fire departments may not be able to cope with the anticipated volume of plans. This fact is a real problem and I urge the fire departments, notwithstanding these restraints, to act as promptly as possible.[7]

Guidelines:

Recommendation:

15.5 Guidelines for the preparation of fire safety plans for all occupancies should be completed by the Office of the Fire Marshal as soon as possible, and be available for distribution to the appropriate building owners.

Fire safety plans cannot be identical for all highrise buildings, even within any one occupancy. They must be prepared on a building-by-building basis. I believe, however, that once guidelines are prepared and available to building owners, they will be used as the basis for preparing most fire safety plans. This should result in fire safety plans for individual buildings within each occupancy being similar in *form*. If Chief Fire Officials across the Province use the guidelines as the basis for their review and approval of fire safety plans, and if there is a consensus amongst the Chief Fire Officials across the Province on important issues such as evacuation procedures, there will also be an increased probability of the *content* of fire safety plans being similar for individual buildings within each occupancy. Similarity in both form and content is desirable.[8]

Similarity of form would be beneficial to building superintendents and other building staff, because it might cause the maintenance practices and record keeping to be similar in all buildings.

Similarity of content, especially regarding the action to take in a fire, will also cause knowledge of proper evacuation procedures to be transferable or applicable to other buildings. In addition, similarity of content will make the education of occupants through the media more effective because the chance of conflict between that education and evacuation procedures in fire safety plans will be minimized.

When guidelines are prepared, I suggest that a form letter be prepared by the OFM to be used by all Chief Fire Officials. The letter should outline what the guideline document is, advise the owner of his responsibility to prepare a fire safety plan, and inform him where the guidelines are available. Similar letters were used by some municipal fire departments when copies of the OFC were made available to building owners.

Plans on Partial Occupancy:[9]

Recommendation:

15.6 The Ontario Building Code should be amended to require a fire safety plan as a pre-condition of being granted an occupancy permit pursuant to Subsection 2.7.1 of the Ontario Building Code.

Section 18a(3) of the Fire Marshals Act should be amended to allow the Ontario Fire Code to require a fire safety plan for buildings under construction.

An owner can obtain permission to occupy a portion of a new building even though the entire building construction is not complete. The permission is granted by giving the owner an "occupancy permit" pursuant to Subection 2.7.1 of the Ontario Building Code. That Subsection stipulates certain pre-conditions which must be satisfied before an occupancy permit may be issued. The requirement of a fire safety plan is not one of those preconditions.

Rashmi Nathwani, Deputy Chief Building Official for the City of Toronto, testified that an occupancy permit is issued for every new highrise building constructed in the City of Toronto because partial occupancy takes place in every highrise building. Christopher Fillingham believed that not much consideration has been given by the enforcement agencies or the design professions as to whether fire safety plans should be required on partial occupancy of new buildings.[10]

It is my opinion that fire safety plans are necessary on a partial occupancy of a building. The people using a partially occupied building should have the protection of a fire safety plan. An argument could be made that it is especially important at this early stage because of increased sources of ignition resulting from the ongoing construction activity.

Roy Philippe was asked about the practicality of requiring fire safety plans on partial occupancy. He replied:

> ". . .it's appropriate that a plan be placed as soon as possible. The difficulty you have, obviously, is establishing the organization and designation of personnel. . . The plan could be in place, the actual implementation of the plan through designation of the emergency organization may take time. . .I also wouldn't suggest that a plan is cast in stone when it's prepared at that stage, that through dialogue with. . .the supervisory staff there may be modifications that could be made."[11]

Mr. Philippe's concerns are legitimate. The fire safety plan on partial occupancy could not be the "final" fire safety plan for the building, nor could it contain all of the essential ingredients required by Section 2.8 of the Ontario Fire Code. The minimum requirements of a "fire safety plan for partial occupancy" will have to be clearly defined and be referenced in both the OBC and the Ontario Fire Code.

The *Fire Marshals Act* provides that the OFC, including the requirement for a fire safety plan, does not apply to a building that is under construction within the meaning of the *Building Code Act*.[12] If a fire safety plan is to be required on partial occupancy, the contents of the plan should be regulated by the Ontario Fire Code. Section 18a(3) of the FMA will therefore require amendment.

Responsibility for Preparation and Implementation of Fire Safety Plans:

When examining the responsibility for preparation and implementation of fire safety plans, one must examine relevant Sections of the Ontario Fire Code:

> Article 1.1.1.1:
> Unless otherwise specified, the *owner* is responsible for carrying out the provisions of this Code.
>
> Subsection 1.2.2:
> — *Occupant* means any person, firm or corporation who is jointly responsible with an *owner* in respect of the property under consideration over which the *occupant* has control.

- *Owner* means any person, firm or corporation controlling the property under consideration.
- *Supervisory staff* means those *occupants* of a building who have some delegated responsibility for the fire safety of other *occupants* under the fire safety plan and may also refer to the local fire department where it assumes these responsibilities. (italics added)

The responsibility for the preparation of a fire safety plan rests upon the owner. There is nothing in the OFC to suggest that anyone else should do this job. The survey of Chief Fire Officials conducted by the Inquiry shows that the large majority of the Fire Chiefs in the Province of Ontario understand that the preparation of fire safety plans is the owner's responsibility, and that the function of the fire department is to offer assistance and ultimate approval (Exhibit 179, Exhibit 180). I note that the following comments were, however, received by the Inquiry. The Fire Chief of the City of Brampton commented:

> "The onus whether we like it or not is on the fire departments to prepare the fire safety plans for each building required to have same."

The Fire Chief in Mississauga said:

> "Very few property owners will submit a fire safety plan unless they are forced to do so. In many cases they expect the local fire department to prepare a plan for them."

With some justification, the Fire Chief from North York said as follows:

> "To date, a total of four buildings have submitted plans for acceptance/approval — however, it is our opinion most property owners are waiting for more specific directions as to the actual mechanics of such plans."

Mr. Donald Boehmer, a witness called on behalf of CIPREC suggested that, while the local fire departments should be giving assistance, he does not believe that it is the fire department's responsibility to put together the fire safety plans. It was his view that fire safety plans should be developed by someone who is knowledgable about the building. He agreed that fire safety plans must be developed and implemented on the basis of *individual* buildings. When buildings are part of the same complex and are of similar design, there could be a standard plan but the plan would still require modifications for each building.

The preparation of a fire safety plan requires a review of the individual building by the person preparing the plan. In doing this review, this person becomes aware of the fire safety features of the building, how they are to be used and maintained. In some cases, the preparation of the fire safety plan will also draw to this person's attention the need for better supervision. Further, defective or inadequate equipment will be identified and any problems should be corrected.

Obviously, if the process of doing a building review and preparing a fire safety plan is to be of benefit to the person preparing the plan, that person must be involved in the day-to-day management of the building. In a great many cases, the legal "owner" of a building is not involved in actual management. In my view, a management company would be a "person, firm or corporation controlling the property", and would therefore be caught by the definition of "owner" in the Ontario Fire Code. Concern was expressed to the Inquiry that in some cases the actual manager may not receive the necessary support from the legal owner. This is fair comment. The answer, however, must arise from the answer to this question; "Did the manager neglect his duty or was he legitimately prevented from performing his duty by the owner?" If the former occurs, then the manager should not be allowed to avoid the sanction imposed by the Ontario Fire Code.

I have more concern with the definition of "occupant" in the Ontario Fire Code. It was suggested that, where the word "occupant" in the OFC is italicized it has one meaning, and where it is not, it has a different meaning. It is confusing to attempt to interpret a Statute where one word can have two meanings. I find it difficult to really understand who the "occupant" is meant to be. In addition, the OFC does not clearly impose an obligation upon any occupant to be responsible for the implementation of a fire safety plan.

Recommendation:

15.7 The definition of the word "occupant" in the Ontario Fire Code should be amended to refer to any person, firm or corporation which occupies the building for any purpose.

Recommendation:

15.8 The words "major tenant" should be defined in the Ontario Fire Code, and should include any person, firm or corporation having control over any portion of the building, including the persons therein.

Recommendation:

15.9 Clauses 2.8.2.1(1)(c) and 2.8.3.1(1)(c) of the Ontario Fire Code should not be amended, thus retaining the reference to "occupants".

Recommendation:

15.10 A fire safety plan should include a reference to the organization of major tenants and the delegation of responsibility to them to carry out fire safety duties, and Sentences 2.8.2.1(1) and 2.8.3.1(1) of the Ontario Fire Code should be amended accordingly.

As I understand it, the problem which is intended to be addressed by the present definition of "occupant" in the OFC arises primarily in commercial buildings. The tenants of commercial buildings are persons, firms or corporations who are in control of portions of the building and of the employees who are present in those portions of the building. These tenants may be called "major tenants". Evidence heard by the Inquiry showed that these major tenants, both in the private sector and in the Provincial Government, are often reluctant to take responsibility for implementing fire safety plans because they do not see themselves as jointly responsible with the owner in respect of the *property*. This is very serious, because as a practical matter, the failure of these tenants to assist in implementation will jeopardize the entire fire safety plan.

Roy Philippe believes that the intent of the definition of "occupant" is to make employers or merchants, who are building tenants, and who control people within the building (their employees) and perhaps "control" part of the building itself, jointly responsible with the owner for implementation of the fire safety plan.

I see two problems with the present definition of "occupant". First, the word "occupant" in normal language refers to persons who are occupying a building, and is not limited to major tenants having control over portions of the building or people within the building. Note that throughout this report it has been necessary to distinguish between the use of the term "occupant" in normal language — that is, to mean persons who are occupying a building — and the defined term "occupant" as found in the Ontario Fire Code. Second, it appears very difficult to impose responsibilities on major tenants by applying the present definition if the tenant cannot be considered at the outset to be "jointly responsible with the owner in respect of the property". Notwithstanding the intention of the drafters, the section is not sufficiently clear.

Although neither my recommendations nor the OFC impose on people living in highrise buildings any responsibility for the implementation of fire safety plans, the evidence of the Federation of Metro Tenants Associations and of individual tenants suggests that there is a desire and willingness on the part of some tenants to be involved in the preparation and implementation of the fire safety plan. Dale Martin, of the Federation of Metro Tenants Associations, suggested that the structure that is used in organizing tenants in specific buildings could be beneficial in soliciting the assistance of tenants in the preparation and implementation of fire safety plans.

Highrise condominium apartments are no less in need of fire safety plans. I appreciate that the nature of condominium ownership imposes a unique problem in determining who is responsible for the preparation of the fire safety plan. In my view, the condominium corporation itself falls within the definition of "owner" in the Ontario Fire Code.

Evacuation Procedures:

One essential element in any fire safety plan is the establishment of evacuation procedures. These can range from simple directives in a common single-corridor apartment building, to very complex procedures such as those in the First Canadian Place described by Mr. Jack Gringorten.

It is my impression that, in the absence of a fire safety plan containing procedures designed for the specific building, occupants rely on a number of sources in order to get advice about what to do in the event of a fire.

Since becoming involved in this Inquiry, I have found that the single most common question raised by those who occupy highrise buildings is:

> "In the case of a fire or upon hearing the fire alarm, what should I do?"

It is frustrating not being able to give specific answers to this plea for help. The problem is accurately described by Mr. Ronald Bowman, Executive Vice-President of the Ontario Professional Fire Fighters Association, when he said:

> "Every fire is a different situation, a fluid situation I have heard it described as. If the fire progresses, the decision changes. . .in the initial stages of fire, evacuation, quick evacuation may be your best choice — again, depending on where you are in the building — and of course as the fire progresses that may be a quick way to kill yourself, getting out of your apartment, so I don't think there is any hard and fast rule. It changes with every situation in our opinion."[13]

To paraphrase the evidence of staff of the OFM, in the case of fire in a highrise building the best place to be is outside the building. The great weight of opinion expressed before this Inquiry is that evacuation must be considered the first choice. The only contradictory opinion I am aware of is found in the pamphlets handed out by the City of Brampton Fire Department.

The best view appears to be that the occupants should always attempt to evacuate, and only if this is impossible should they attempt to defend in place. More detailed comments on this topic can be found in Chapter 13, under the subheading "Stay or Leave".

Fire Drills:

The OFC provides:

> 2.8.2.1(1): A fire safety plan acceptable to the Chief Fire Official which includes the following measures shall be prepared in buildings regulated by Article 2.8.1.1:
> (d) the holding of fire drills.
>
> 2.8.3.1(1) The procedure for conducting fire drills in buildings specified in Article 2.8.1.1 shall be determined by the fire department in consultation with the person in charge of the building, taking into consideration
> (a) the building occupancy and its fire hazards,
> (b) the safety features provided in the building,
> (c) the desirable degree of participation of occupants other than supervisory staff,
> (d) the number and degree of experience of participating supervisory staff, and
> (e) the testing and operation of fire emergency systems installed in buildings within the scope of Subsection 3.2.6 of the Building Code.
>
> 2.8.3.2(1) Fire drills as described in Sentence 2.8.3.1(1) shall be held once during each 12-month period for the supervisory staff, except that
> (a) in day-care centres and Group B occupancy [institutional buildings] such drills shall be held monthly,
> (c) in buildings within the scope of Subsection 3.2.6 of the Building Code, [highrise buildings] such drills shall be held every 3 months.

While there are difficulties in interpreting these sections, the evidence is that in both residential and commercial buildings compliance of any sort is generally lacking.

Mr. Jack Gringorten of Olympia and York described the fire drills that he has conducted in his buildings for the past ten years. He is a strong proponent of fire safety planning and says:

> ". . .there is no doubt in my mind that properly implemented, rehearsed, and thoroughly understood and practiced, these procedures can guarantee life safety in any building."[14]

He was seriously concerned about the failure of some of his colleagues to follow his example, and implement fire drill programs:

> "Regretably it's not industry wide, and that surprises me because it is a relatively inexpensive trade-off for many of the gizmos and gadgetry that I'm sure His Honour has heard a lot about in these Hearings. That's what surprises me, that the

> program, or a set of procedures designed for life safety, are not regularly implemented by every property owner and manager."[15]

Mr. Tatham is the Senior Vice-President of the Canadian Division of the Oxford Development Group Limited. He is responsible for 7 million square feet of office buildings in Canada, primarily in Calgary, Edmonton and Toronto. He explained that, while fire drills are conducted in his buildings in Edmonton and Calgary, this is not the case in Toronto. Apparently, this is because the general manager of building operations in Toronto received legal advice prior to the passing of the OFC that the voluntary assumption of the responsibility to conduct fire drills could result in legal liability for the owners of highrise buildings. I understood Mr. Tatham to request clarification of the legal liability of the owner who has conducted fire drills as required by the OFC and by his fire safety plan, in the event of loss or damage during a subsequent fire. While the failure to comply with a duty found in regulations may not always result in civil liability for the person having the duty, I know of no situation where individuals are protected by legislation when they are, in fact, negligent. I expect that the normal standards of negligence law would apply in such a fact situation.

Mr. Marvin Sadowski discussed fire drills in apartment buildings. He was asked whether drills for supervisory staff were being done by the industry. He did not believe that this was being done. He suggested that the owners of highrise apartment buildings need to be "prompted to conform to the requirements". He added:

> ". . .it doesn't seem important until something happens to make it important,. . .it may be that fire drills are not high. . .on the priority list of trying to run a business. Sad to say, but I think that perhaps. . .that may be the reason."[16]

It was suggested that the Ontario Government should take the lead in following requirements of its own legislation, by having in place comprehensive fire safety plans, and conducting regular fire drills. However, Mr. Jack Hastings, the Manager of the Safety Section of the Ontario Ministry of Government Services, testified that in his experience the most difficult part of implementing fire safety programs in Ontario Government buildings has been to obtain participation in fire drills. He suggests that some employees are reluctant to be involved because they are busy. Others are actually hostile. He agreed with Commission Counsel that fire drills are not being conducted on a regular basis in Government buildings. He added:

> "I think if you consider the number of buildings and the number of programs, there are some. . .that have not as yet had a fire drill."[17]

He suggested that the message should be driven home to senior people in the Ministries that fire drills are important and that Ministry staff should cooperate with requests that fire drills be conducted. He commented that, without their participation in drills, he cannot be sure that occupants will be aware of what they should be doing. He said:

> "Non-involvement or non-participation has to make you totally unaware of what is going on and you would be like a sheep, when everybody is evacuating you would go along with the crowd and may or may not be sure of just where you are supposed to be."[18]

Recommendation:

15.11 The Ministers and Deputy Ministers in each Ministry of the Provincial Government should be made aware of the requirements of the Ontario Fire Code, and should encourage participation by Ministry staff.

Preparation of Fire Drill Procedures:

The fire safety plans are to be prepared by the owner and submitted to the fire department for approval. They must contain measures for the holding of fire drills. Confusion arises however, because Sentence 2.8.3.1(1) says that the procedure for conducting fire drills *shall* be determined by the fire department. I cannot tell from these sections who is expected to do what and in what order.

Recommendation:

15.12 The onus should be on the building owner to include the procedure for conducting fire drills in the fire safety plan. The fire department would then deal with the procedure proposed by the owner when reviewing the fire safety plan submitted by the owner.

It appears onerous to require local fire departments to initiate the preparation of procedures for fire drills in every building which is required to have a fire safety plan. Further, I find it confusing that the owner is required to submit a plan which includes measures for fire drills, while the fire department appears to have the responsibility to determine the procedure for conducting fire drills. In my view, this confusion has resulted in the failure of both the owners and the fire departments to take positive steps with regard to fire drills.

The questionnaire sent to Chief Fire Officials by Inquiry staff asked whether there were any procedures established in their municipalities for evacuation of occupants during fire drills. With regard to highrise apartments, roughly half of the respondents answered that there were procedures established. Generally, fire departments reported some difficulty in requiring total evacuation of apartment buildings. Many of them limited the establishment of fire drill procedures to specific types of buildings, for instance, senior citizens apartment buildings. Of the fire departments which have no procedures established, Scarborough is in the process of establishing a policy with regard to fire drills, while Brampton says that such drills are "not practical or warranted"(Exhibits 179 and 180).

The response of the Fire Chiefs was similar with regard to highrise offices and hotels. About half of the departments had established procedures for evacuation of these buildings, with Ottawa responding:

> "Phased evacuation where a fire warden system is in place. Otherwise, our department's policy is full evacuation."[19]

With regard to hotels, about 50% of the respondents indicated that there were procedures for fire drills in hotels, established either by the fire department or the inspector under the *Hotel Fire Safety Act*.

Over 80% of the respondents reported having procedures established in institutional buildings. The procedures generally include horizontal evacuation. This is the practice of moving persons from a fire affected area to an area of safety *on the same floor*. These areas of safety are usually created by the use of smoke barrier doors. In relation to institutional buildings, reference was also made to guidelines that have been supplied by the OFM, other assistance given by Provincial authorities, and the acceptance of procedures that are established by those in charge of the buildings.

Conduct of Fire Drills:

The owners of buildings are responsible for carrying out the provisions of the OFC, and therefore the drills provided for in Sentence 2.8.3.2(1) must be conducted by the owner. As a practical matter, the owner must rely on the cooperation of *major tenants* in commercial buildings to ensure participation of building occupants. These major tenants are employers, and as such are in control of the people in the building. The same concern applies to hotels, where there can be mercantile areas and restaurants.

Recommendation:

15.13 The Ontario Fire Code and the* Hotel Fire Safety Act *should be clarified to impose obligations on employers (major tenants) to cooperate with the owner and support efforts to conduct fire drills.

While there was some suggestion that the responsibility for the conduct of fire drills should be imposed on fire departments, I am satisfied that this responsibility should be that of the owners of highrise buildings, in cooperation with major tenants and other occupants. Although some owners may protest that drills are impractical or impossible, I am pleased to be able to draw their attention to the impressive programs being carried out in a number of very large commercial buildings.

The First Canadian Place in Toronto is an example of a building that uses a warden system. In the case of an emergency, supervisory staff are able to communicate with persons who are responsible for occupants of each floor. The drills that are carried out in this building are primarily for the rehearsal of wardens, while other occupants are required to leave their work for a short time and practice their own evacuation up to the point of being ready to leave the floor. In my view, if such a program is practical in these very large buildings, I can see no reason why the owners of smaller buildings cannot attempt something similar.

Participation:

In highrise buildings, other than institutional buildings, the OFC requires a fire drill every 3 months for supervisory staff. Further, the procedure for fire drills that is adopted by the fire safety plan must be designed after considering the desirable degree of participation of occupants other than supervisory staff. Therefore, at present there is a minimum legal requirement that supervisory staff participate in drills, with the further possibility of a requirement for drills that include other occupants.

It should be noted that most people have taken the position that occupants are apathetic to fire drills. In most cases, occupants do not appear to be involved in fire drills. I believe that the reason for the apathy arises from the failure to provide the essential background material, such as the fire safety plan, which would allow a fire drill to be a meaningful process. I believe that occupants would be more cooperative if they were aware of the fire safety plan itself and the benefits that can accrue to them from their involvement in implementing the plan.

Jake Pauls, an expert in the movement of large numbers of people, testified that fire drills will not only acquaint the occupants of a building with the location of the exits and the nature of the stairs, but will also familiarize them with the experience of an evacuation involving other occupants.

Voice Communication:

The need for some means of giving occupants important information during a fire is reviewed in my discussion of human behaviour in fires.[20] People in fire situations need to know the location of the fire, how long they can expect to have to wait for rescue, or what is being done to rescue them; and if it can be given, information telling them what they should do.

Recommendation:

15.14 Clause 2.8.2.4(1)(a) of the Ontario Fire Code which requires the instruction of supervisory staff in the use of the voice communication system should be enforced.

During the Inquiry, there were differing opinions as to who was responsible for the use of the voice communication system in a fire emergency. Some representatives of the apartment industry testified that the fire service should operate the voice communication equipment, and the building staff should not be involved in any way. On the other hand, the fire service feel they are in charge of the fire emergency, and do not expect to be involved in the direct operation of the voice communication system. The fire service is, however, prepared to give instructions to the voice communication operator regarding the content of the communications.

In response to the suggestion that apartment staff should not be involved in operating the voice communication system, I need only refer to Clause 2.8.2.4(1)(a) of the Ontario Fire Code. That Clause requires supervisory staff of high buildings to be instructed on the use of the voice communication system. If one considers that supervisory staff in high buildings are expected to be available prior to arrival of the fire service[21] surely it is only common sense that communication with occupants might be necessary during this period of time.

It seems to me that it would be inexpensive to determine if everyone within the building could hear the voice communication system, and secondly, if those persons who use the voice communication system can be understood. If these were the only things that the fire safety plan achieved in terms of voice communication systems, it would constitute a great advance over the present situation.

Recommendation:

15.15 A separate standard should be developed for the testing, inspection and maintenance of voice communication systems.

The OFC requires voice communication systems to be maintained in accordance with ULC S-536-1979.[22] This Standard is entitled, "Standard for the Testing, Inspection and Maintenance of Existing Fire Alarm Systems." As its title suggests, the standard relates to fire alarm systems — not voice communication systems. The Inquiry was advised by staff of the OFM that the standard is applied to voice communication systems by expanding the meaning of the terms used in the standard so they refer to elements of a voice communication system. For example, this standard contains the following provisions:

"Initiating Devices — Manual

3.3.2.1 Each manual alarm station shall be operated to ensure that it functions as intended.

Initiating Devices — Automatic

3.3.3.1 Each automatic initiating device shall be activated or operated in accordance with the manufacturers instructions to ensure that it functions as intended.

Alarm Signalling Appliances

3.3.4.1 General — Alarm signalling appliances shall be activated to ensure their intended function."

Mr. Hess suggested that the initiating device of a voice communication system is the microphone or the recorded announcement, and therefore one of the two sections dealing with "initiating devices" would apply. He also testified that the speakers would be equivalent to the "alarm signalling appliances" and therefore, Article 3.3.4.1 of the Standard would apply to them. In my view, it is nonsensical to have to jump through these sorts of hoops to make this standard apply to voice communication systems. There should be a separate standard for voice communication systems. I am concerned that whatever standard is employed for voice communication, the system should be designed to be clearly audible in furnished suites with the doors closed.

Plan for Maintenance:

The OFC requires the checking, inspecting and testing of fire protection equipment.[23] Improper maintenance can be a major contributor to property and life loss. For example, the failure to ensure that fire doors are closed and that door closers operate properly contributes to smoke migration. Lack of proper maintenance of sprinkler systems, fire alarm systems, or standpipe and hose systems, can result in these protective devices failing to perform their intended function in a fire emergency.[24]

Proper maintenance was lacking in almost every fire discussed in Chapters 3 through 6. Both building superintendents, and representatives of the fire service who appeared before the Inquiry agreed that more attention to maintenance of fire protection equipment is essential. This must be achieved through a combination of education and enforcement which I have discussed in earlier Chapters.

Record Keeping:

The OFC provides as follows:

> 1.1.2.1: A written record shall be kept of all *tests* and corrective measures for a period of two years after they are made, and the records shall be made available upon request to the *Chief Fire Official*.

Recommendation:

15.16 The written records required by the Ontario Fire Code to be kept by building owners should be requested and examined during inspections.

The evidence heard by the Inquiry indicates quite strongly that the provision of the OFC requiring the keeping of records is not being complied with by those in charge of highrise buildings. It appears to me that Mr. Gringorten was correct when he made the comment that there are many owners who do not accept the responsibilities described in the OFC, and this seems particularly true with regard to record keeping.

Mr. Marvin Sadowski submitted a document which is used by his organization when conducting tests of fire alarm systems. He was not aware of any similar form that is in regular use for the purpose of documenting tests of other life safety systems, for example, sprinkler systems, voice communication or smoke control systems. While he believes that the tests themselves are being done in the industry, he advised the Inquiry that he would be surprised if records of those tests were being kept.

While both Chief Wretham of Scarborough and Assistant Deputy Chief Sproule of Toronto suggested that the fire prevention officers are supposed to ask for these records when they are doing inspections, neither of these men was able to assure me that this was in fact being done. Further, because the OFC has been in effect a fairly short time, a great many buildings have yet to be inspected pursuant to the Code.

Recommendation:

15.17 A standard form of record book or log book listing the tests required under the Ontario Fire Code, together with the frequency thereof should be provided for in the Ontario Fire Code.

Mr. Beesley, the Chairman of the Ontario Housing Corporation, recommended that a standard form of record or log book should be prepared. The Ontario Housing Corporation is probably the largest residential landlord in the Province, and the comment from the Chairman of that organization that a standard book would be advisable is very persuasive. Assistant Deputy Chief Sproule believed that it would be practical to have a standard form for record keeping, and that it would be useful not only for the fire prevention officers, but also for the owners.

I wish to point out, however, that the requirements for testing equipment are quite clearly set out in the OFC, and are also reproduced in the new guidelines for the preparation of fire safety plans in residential buildings (Exhibit 286). The fire safety plans being prepared by owners must provide for proper maintenance, inspection and testing of equipment, and should also provide for the keeping of records. While there is no standard log book issued by an authority such as the OFM, I am advised that there are commercial products available which would allow the keeping of these records. If these records have not been kept, it is my view that this matter should be the subject of prosecution.

The testing of some of the life safety systems is often done by specialists who perform the work pursuant to a contract. Certainly, persons who hold themselves out as experts in these areas should be aware that the owner must be provided with a record of these tests. Perhaps if there were mandatory licencing of certain trades, in particular fire alarm and sprinkler trades, the preparation of inspection records could be considered part of the education of these tradespeople.[25]

Finally, although the OFC does not require the keeping of records of "checks", and "inspections", both of which are defined terms in the OFC, consideration should be given to the use of log books in order to ensure that this work is being done. This would require an amendment to the Ontario Fire Code.

Handicapped:

Recommendation:

15.18 ***The Ontario Fire Code should be amended to change the reference to non-ambulatory occupants in Sentence 2.8.2.4(1) to "those in need of assistance."***

According to Roy Philippe, the intent of the OFC is to require the fire safety plans for highrise buildings to include procedures for evacuation of those in need of assistance (2.8.2.4(1)). However, the section currently refers to "non-ambulatory occupants" only. Therefore, this section could be interpreted as using wheelchairs as the prime determinant. The use of a broader description such as "persons in need of assistance" could perform the very useful function of drawing persons with other, less obvious, handicaps to the attention of those preparing fire safety plans.

Recommendation:

15.19 ***Building owners/managers of all highrise buildings and the handicapped occupants should ensure that a list of all handicapped occupants within the building with a description of their disability, and their location, be available for firefighters when they respond to a fire.***

Mr. Herie, the Executive Director of the CNIB, stressed that the most important aspect of life safety for disabled persons is the need for rescuers to have accurate information about the location of those persons. For example, "The Building Emergency Evacuation Program for Disabled Persons" used by the Government of Ontario (Exhibit 176) provides for a register of disabled persons to be kept in the building. However, the guide does not appear to make provisions for bringing the list to the attention of firefighters. In many cases, in office spaces which are leased by the Provincial Government rather than Government owned, there is no registry kept at all. While both Mr. Herie and Mr. Ronald Brown, a gentleman with cerebral palsy, had no hesitation in choosing safety over anonymity, it appears that handicapped persons themselves often do not take the initiative in informing the fire service of their whereabouts. The problem is compounded because, while persons in the fire service agreed that it would be a good idea to have information about those in need of special assistance, they appeared to be a little hesitant when asked what they would do with the information. It appears onerous to expect the fire service to maintain such information in their pre-fire plans. For this reason, it seems most reasonable that the list be available in the building, at the central alarm and control facility if it exists, for use during a response. Some procedure for keeping this sort of list should be standard practice in hotels.

EGRESS

Smoke control is needed in highrise buildings because studies have indicated that without it, there may be insufficient time to totally evacuate a highrise building in an emergency situation. For example, the evacuation of the First Canadian Place during the fire incident described in Chapter 5 took approximately 1½ hours.

The OBC prescribes standards for the design of stairwells, emergency lighting, exit lighting, exit signs, and exit door hardware. In addition, elevators must be designed for use by firefighters in emergency situations to assist in both extinguishing the fire and rescue.

The OFC requires the maintenance of the items referred to above, and mandates the preparation of fire safety plans which, in highrise buildings, must include provisions for "evacuating endangered occupants. . .including the procedures for the use of elevators and for evacuation of non-ambulatory occupants".[26]

The study of human behaviour in fires has demonstrated the need to reconsider a number of important matters related to egress from highrise buildings. Some questions which have arisen and must be answered are:

— There is a conflict between those who desire stairwell doors to be locked from the inside for security reasons, and those who, for reasons of safety, believe they should be open at all times. Can this conflict be resolved, and if so, how?

— Should rooftop access be available to occupants, and if so, should they be encouraged to regard the roof as an area of safety?

— Are present code provisions regarding exit lighting and exit signs performing their intended functions?

— Should elevators be used as a means of evacuation now, and if not now, in the future?

— Are code provisions regarding stair design, including their location, in need of reassessment?

In this portion of the Chapter I will review the evidence relating to the five issues I have identified, and research related to means of egress.

Locked Stairwell Doors:

Recommendation:

15.20 The locking of exit stairwell doors from the inside should be prohibited unless a building owner can convince the authority having jurisdiction that a specific floor must be secure, and that security cannot be provided by any reasonable means other than locking the exit stairwell doors.

The concern regarding security arises primarily in office buildings which contain brokerage firms, law offices, banks, and other businesses which involve the storing of valuables or confidential records.

The OBC contains the following provision regarding emergency access to floor areas:

> In buildings that are regulated by the provisions of Subsection 3.2.6 [high buildings],
>
> a) doors providing access to floor areas into which occupants have to enter in an emergency shall not have locking devices to prevent such entry; and
>
> b) it shall be possible at all times at intervals of 5 storeys or less in an exit stair to pass through an unlocked door from the exit stairway into the floor area, and each such door shall be suitably identified by a sign on the stairway side.[27]

In other words, except for the exit doors on every 5th floor, the OBC allows all exit stairwell doors to be locked from the inside. If someone enters the stairwell in a fire emergency, and has to get out of that stairwell because of smoke or for some other reason, that person could be several floor levels away from an unlocked door.

The Inquiry had the benefit of the evidence of Mr. Jake Pauls, a leading expert in the movement of people. Mr. Pauls has studied the evacuation of highrise buildings, and stated that locked stairwell doors are very counterproductive to safety. He testified that security and egress is perhaps the "largest looming issue" at the present time in terms of the usefulness of exits that are required by buildings codes. He stated that because stairwell doors are locked from the inside, people are discouraged from using the stairs under normal conditions. Based on research done by himself and others, there is no reason to believe that stairs, if not used under normal conditions, will be used efficiently in emergencies. In his view, "we are simply wasting our money locking away these exits."[28]

Dr. John Bryan agreed with Mr. Pauls on the need to have stairwells used regularly to improve their usefulness in an emergency.

Dr. Bryan's evidence regarding his study of human behaviour at the MGM Grand fire is also relevant to this issue. His study revealed that 50 or more people were locked in one of the exit stairwells because doors locked behind them after they entered the stairwell. One guest who was in that stairwell believes that if the door to the roof had not been opened, those 50 people would have died in the stairwell.

Dr. Bryan's study also indicated that people will move through smoke. This is significant because if people enter a smoke filled stairwell and attempt to move through it, their retreat out of that exit stairwell, if necessary, could be prevented by the locked stairwell door.

The concern regarding safety can only be met by having doors to exit stairwells open during emergency situations. On the other hand, I believe security can be provided by means other than locking the doors to exit stairwells from the inside. In my view, the general rule should be that doors to exit stairwells should be open from both sides at all times, and if an exception is to be made, the onus should be on the person who wants them locked to satisfy the approving authority that security is necessary, and that security cannot be provided in any way other than locking the stairwell door.

Installations which might provide security and allow these doors to remain open could include T.V. monitors in stairwells, or modifications within floor areas which would allow someone to leave an exit stairwell and go to at least one other exit stairwell without entering an office space. Another option which I understand has been employed in some Ontario buildings, with the approval of the B.M.E.C., is to have those stairwell doors which are locked from the inside, equipped with devices which are connected to the fire alarm. When the alarm is activated, the device automatically unlocks the door.

I recognize that this recommendation grants a certain amount of discretion to enforcement authorities, and could result in inconsistent application. If this is considered unacceptable, an alternative would be to require doors to be open more frequently than every five floors.

It is of interest to note that this particular conflict between safety and security has been resolved by the Ontario hotel industry in favour of safety. They have agreed not to lock doors to exit stairwells from the inside. The HFSA and the OBC should be amended to reflect this agreement.

Rooftop Access:

Recommendation:

15.21 Doors and hatches providing access to rooftops in highrise buildings should not be locked during fire emergencies.

The OBC contains a provision which, for all practical purposes, would require all highrise buildings to provide access to the roof. Sentence 3.5.4.3(1) of the OBC states:

> On buildings more than 3 storeys in building height where the slope of the roof is less than 3 in. in 12 in. all main roof areas shall be provided with direct access from the floor areas immediately below either by a stairway or by a hatchway at least 22 in. by 36 in. with a fixed ladder.

This Section appears under the Heading, "Horizontal Service Spaces and Service Facilities", and I do not believe that it is contained within the OBC for the purpose of providing a means of escape for occupants in the case of a fire or other emergency. Although access to the roof is provided for other reasons, it is apparent that the occupants of highrise buildings will make use of this roof access when they believe it provides a means of escaping fire and smoke.

Building occupants went to the roof in the fires at 88 Bloor Street East, the MGM Grand Hotel fire, and the Inn on the Park fire described in earlier chapters. In these fires the door providing rooftop access was locked. In the MGM Grand Hotel fire the door was opened by hotel staff. In the other two fires it was forced open. If those in the stairwell had been unable to open the rooftop door, the numbers of deaths in those fires could have been higher. In the apartment fire at 170 Lees Avenue in Ottawa, occupants attempted to go to the roof, but were prevented from doing so as a result of a locked door which gave access to the roof. In that case, two persons died immediately next to the roof door.

The study of human behaviour in fires has indicated that people will go to the roof. I therefore believe that roof doors should be *unlocked* during a fire situation. I must stress that the main purpose of this recommendation is not to encourage people to go to the roof, but to ensure that those who do attempt to escape from the fire by this means will not be trapped.

If the door providing rooftop access is opened during a fire, and particularly if it is left open, it will increase the rate of air movement into the stairwell from floor areas, and the rate at which the air will travel up the stairwell. In other words, the natural stack action within the stairwell is increased, and the stairwell, in effect, acts like a chimney. This can substantially increase the risk to occupants within the stairwell. It is apparent that if rooftop access is to be available to occupants, steps must be taken to ensure that the doors close behind those who go to the roof. In order to avoid the problems created by doors to the roof being left open during a fire, consideration must be given to the installation of self-closing devices.

In those buildings where owners desire the doors to the roof to be locked during normal situations, the doors could be retrofitted with a device which would automatically unlock the door on the sounding of the fire alarm.

Helicopters have been used for rescue purposes in a number of highrise fires, both in the United States and in other countries. I believe the reports of those fires encourage occupants of highrise buildings to regard the roof as an area of safety. Although the roof can provide safety, it can, in certain circumstances, be an extremely dangerous place. Many rooftops have a very small area of open space, and many have no perimeter barriers or guardrails. If too many people go to the roof the hazards are obvious.

The use of helicopters for rescue is plagued with a number of significant problems. Examples of such problems are the lack of helicopter operators who are trained for rooftop rescue, the difficulty of crowd control on the roof, the effect of weather and wind conditions, and the existence of rooftop obstacles on most highrise buildings.

Even though I have recommended rooftop access be available during fire emergencies, the many problems that can arise due to people going to the roof, and the difficulty of rooftop rescue, require that "escape" to the roof be regarded as a *last resort only*. The educational program recommended in Chapter 13 should include information which stresses that the roof is not necessarily a safe place, that the roof may have no protective railings, that rescue by helicopter is highly unlikely, and that the safety of others in the stairwell can be threatened if the door to the roof is open.

Recommendation:

15.22 A committee should be formed to study and make recommendations regarding the feasibility of integrating the use of helicopters into highrise fire rescue operations. Such a committee should include representatives from affected groups such as the fire service, police, military, helicopter operators and building owners.

Bell Helicopter was granted standing at the Inquiry. They filed a written brief and gave oral evidence during the Hearings. They acknowledged the difficulties of helicopter rescue as described above and believed that the possibility of creating a contingency plan for helicopter rescue *as a last resort* should be studied. I agree with their recommendation.

The Inquiry was advised that the City of Toronto Fire Department has a task group examining firefighting techniques for highrise buildings. One matter that is being examined is whether helicopters can be used in any capacity. I strongly suggest that any committee created pursuant to my recommendation inform itself of work done by the City of Toronto task group in order to avoid any duplication of effort. It should also study the plans which contemplate helicopter use for rescue purposes which are being developed by Chicago, Houston and Dallas-Fort Worth.[29]

Exit Lighting and Exit Signs:

In the fire at the Inn on the Park, some guests left one of the exit stairwells at the lowest level and found themselves at the end of a long corridor. There were no signs which indicated that the corridor led directly to the outside. As a result, those guests were confused, and in order to find a means of escape they re-entered the smoke filled stairwell they had just left.

In the fire at the Westchase Hilton Hotel, guests reported being confused between doors leading to exit stairwells and doors leading to locked service closets which were located in the same foyer.

As discussed in Chapter 14, in Dr. Bryan's analysis of human behaviour in fires in residential and health care occupancies (Project People and Project People II), and in one public assembly occupancy, only a very small portion of the participants (between 6 and 8% of the total participant population) indicated they noticed or observed the exit signs.

Although technically the signs on the inside of stairwell doors may not be *exit* signs, I personally have found some signs confusing. For example, do the words "1st Floor" on the inside of the stairwell door mean the first floor above grade or does it indicate the street level where egress from the building is provided?

Exit lights are located above exit doors, and emergency lighting is located at ceiling level — the first area to be obscured by smoke. Changes to building code provisions regarding location of these items may be required.

Dr. John Bryan testified that exit signs become mere background, and that the NFPA Life Safety Code now allows exit signs to flash. In his view, this is an improvement because it will attract people's attention when required.

Colour comparison studies were conducted in 1964 to determine which colours were most visible to persons looking through smoke screens. In spite of the conclusions of that study, few codes designate a specific colour for exit signs. I understood Dr. Bryan to suggest that even those codes which do specify a colour do not give effect to the results of these studies.[30]

In my view, it should be a relatively straight forward matter to have exit lights and signs which could be seen during fire emergencies, and which are not confusing and will lead the occupant to the outside of the building.

In Chapter 10, which deals with retrofit, I recommended that exit doors be clearly identified, and that the stairwell side of doors to exit stairwells be clearly marked with the floor number. The OBC does not require stairwell doors to be clearly identified on the inside although reentry floors must be marked. I believe the OBC should contain a provision to this effect.

Elevator as a means of evacuation:

Based on the evidence before this Inquiry, I do not believe the time has arrived for use of the elevators as a means of evacuation for the general building population.

Issues related to the use of elevators as a means of evacuation are discussed in Chapter 8.[31] As discussed, the problems to be addressed are not limited to technical matters. Problems of crowd management and other elements of human behaviour would have to be studied in order to have efficient use of elevators for general evacuation.

Stair Design:

Occupants of highrise buildings are instructed not to use the elevators in fire emergencies. If, as stated in Chapter 13, occupants should evacuate the building if possible, the stairs will provide the only means of egress.

Mr. Jake Pauls advised the Inquiry that some present code provisions are based on assumptions which are both outdated and incorrect. For example, the traditional method of determining the capacity of a 44 inch stair assumes people will go down the exit stairwells in two lines with two people on each stair. Mr. Pauls' studies of actual evacuation of highrise buildings indicate that people will exit in a "staggered formation" with only one person per stair. The rate of evacuation and the most appropriate stair design is affected by how people actually move in the stairwells.

He also advised that some provisions regarding stair design in the OBC were developed when external fire escapes were common, and others are based on laboratory conditions as opposed to observation of field conditions which is a more reliable basis upon which to design stairs.[32]

A final example of a section of the OBC in need of consideration is Clause 3.4.8.9(1)(c). That section provides that, "treads and risers in every exit stair shall be designed so that the treads have a *minimum* run of 9 in. exclusive of the nosing." In Mr. Pauls' view, a code minimum of nine inches is "grossly inadequate" for safe egress of ambulatory occupants. In addition, if evacuation of handicapped persons in wheelchairs is necessary, the Inquiry was advised that the nine inch width is too narrow.

Recommendation:

15.23 The means of egress should be the subject matter of intensive study at the National Building Code level.

In the United States, the Committee on Safety to Life, which is responsible for the NFPA Life Safety Code (NFPA 101), has a sub-committee which deals solely with means of egress.

I am sure that the list of issues related to egress which require attention would contain many more subjects than those briefly described above. Based on the evidence of Mr. Jake Pauls, I believe there is a necessity to conduct this study.

Self-Help Devices:

The Inquiry received both briefs and oral evidence regarding a number of "self-help devices". Most of those devices relate to egress in some fashion and fall into one of two categories. They were either products such as smoke masks or the Water Jel Fire Blanket which are designed to provide protection during evacuation, or devices such as escape ladders and pulley systems which were designed as actual means of evacuation.

Smoke Masks

Recommendation:

15.24 A performance standard for filter-type smoke masks should be developed, and in the interim the Hazardous Products Branch of the Department of Consumer and Corporate Affairs (Ottawa) should develop standard information which all manufacturers of filter-type smoke masks would be required to provide to consumers.

The Inquiry received briefs from the manufacturers/distributors of two filter-type smoke masks, and heard evidence from representatives of those two companies.[33] Their masks do not contain any independent supply of oxygen, but rely on a filter and face mask to provide protection from carbon-monoxide and other toxic fumes. The effectiveness of these masks can be dependent on a number of factors such as the oxygen supply, the moisture in the air, the amount of particulate matter in the air, and the time frame during which the mask is used in any given fire.

At the present time, there is no legislative control of these smoke masks other than laws preventing false advertising. Both witnesses advocating the use of filter-type smoke masks recommended that a performance standard for this type of mask should be developed. It was their view that such a standard was necessary in order to keep unsafe smoke masks off the market.

The Inquiry was urged by the Ontario Association of Fire Chiefs and the Canadian Association of Fire Chiefs that the filter-type masks be banned until a performance standard is developed. Their main concern was that without meeting a performance standard, filter-type masks can give a false sense of security to users.

The NFPA as recently as March, 1983, indicated that they could not recommend the use of personal filter-type smoke masks (Exhibit 299).

When a product is believed to be hazardous there are a number of ways to regulate it. Options short of banning the product include providing information about the product to the end-user and the development of a performance standard.

In my view, the evidence does not indicate that a problem has occurred to date with this type of smoke mask which would warrant a ban being imposed on its marketing. I would recommend, however, that in order to allow consumers to make an informed decision about whether to buy filter-type smoke masks and how to choose between various types of filter-type smoke masks, the Hazardous Products Branch of the Department of Consumer and Corporate Affairs (Ottawa) should develop standard information which all manufacturers would be required to provide to consumers. The categories of information should be designed to assist the consumer who wishes to engage in wise comparative shopping. There was evidence that there is some interest by the public in obtaining this kind of information.

This recommendation should be regarded as an interim measure pending the development or adoption of a performance standard such as the DIN or NIOSH standards for filter-type smoke masks.[34]

The Inquiry was advised that smoke masks, other than the filter-type, are being sold or can be marketed in Ontario. In some cases, these non-filter-type masks take the form of nothing more than a plastic bag to pull over one's head. In my view, these products can be considered a danger to life safety, and their sale should be prohibited.

Water Jel Fire Blanket (Brief 21)

The distributors of the Water Jel Fire Blanket described it as a medical first-aid device and fire extinguishment device for containing small fires. They testified that this blanket, because of its composition and/or content can be thrown on fires for extinguishment, can be used to cover a person who has to pass through fire, can be placed on burn victims to reduce extent of burns and blistering, and can minimize the chance of infection.

Recommendation:

15.25 Escape devices for highrise buildings should be assessed by a committee composed of representatives of the Building Code Branch and the Ontario Fire Marshal.

As stated above, the self-help devices, other than smoke masks and the Water Jel Fire Blanket, were primarily products which were designed as actual means of evacuation. In terms of their development, they range from mere ideas to products presently being marketed in Ontario.

Mr. Pauls testified that there is a great number of proposed escape devices for highrise buildings. It was his view that such devices should be reviewed by an appropriate body.

It would have been impossible to review in detail all the products referred to the Inquiry. Such a review is, however, required by a body otherwise constituted.

I will describe two such devices which will indicate the type of devices I have referred to. Neither the failure to comment on the merits of either item nor the failure to describe other devices reviewed by the Inquiry should be taken as an indication of my personal view on the merits of the product or the ranking of them in terms of their usefulness.

The descriptions of the two products below outline the positive features *as described by their respective proponents*.

Jomy Folding Escape Ladder (Brief 91)

This is a ladder which is fitted vertically to the outside wall of a building. The ladder is advocated not only as a means of escape but also as a means of access for firefighters.

When not in use, the rectangular ladder folds into a plain rectangular box which is flush with the exterior wall. When open, the ladder consists of rungs, and guard rails which extend the full height on the outside of the ladder at right angles to it. The ladder is installed adjacent to windows and is opened by occupants while still inside the building.

Safescape (Brief 93)

Safescape is a controlled descent device which uses a spooled stainless steel cable and brakes and pully system installed on a building's balcony. Occupants tie themselves into harnesses which are attached to the cable to lower themselves at a controlled rate of speed.

[1] Exhibit 56, Regulation Section 62.

[2] Exhibit 179, p. 1, Question #3.

[3] Exhibit 179. See particularly responses to Questions 2 and 4. It appears that a number of the fire chiefs are discussing emergency evacuation procedures only.

[4] Transcript, Volume 39, p. 36.

[5] Transcript, Volume 38, p. 93.

[6] See also discussion re: Enforcement of a requirement for a fire safety plan in Chapter 2.

[7] See also Chapter 12.

[8] For further discussion on the importance of uniformity in advice regarding action to take in a fire, see Chapter 13.

[9] See also Chapter 9, under Heading, "Commissioning and Fire Safety Plans".

[10] Transcript, Volume 28, p. 16. See also Granek at Transcript, Volume 36, p. 108 and Sproule at Transcript, Volume 44, pp. 29 to 30.

[11] Transcript, Volume 61, pp. 41 to 42.

[12] *Fire Marshals Act*, R.S.O. 1980, c.166, Section 18a(3).

[13] Transcript, Volume 59, p. 53.

[14] Transcript, Volume 53, p. 21.

[15] Transcript, Volume 53, p. 19.

[16] Transcript, Volume 50, p. 106.

[17] Transcript, Volume 38, p. 85.

[18] Transcript, Volume 38, p. 119.

[19] Exhibit 179, p. 5-5.

[20] See Chapter 14.

[21] OFC Clauses 2.8.2.4(1)(c) and (d).

[22] OFC Section 6.3 and Article 7.2.4.1. The current edition of this standard is CAN 4-S536-82.

[23] Part 6 and 7 of the OFC.

[24] Exhibits 163, 166 and 167 list the deficiencies found during OHC's program of Fire Alarm and Emergency System Analysis and surveys of existing sprinkler systems, many of which are attributable to improper maintenance.

[25] See also Chapter 13 for discussion of licencing of trades.

[26] I have recommended this section be amended to refer to "those in need of assistance".

[27] OBC Sentence 3.4.8.15(14).

[28] Transcript, Volume 37, p. 56.

[29] Exhibits 194, 195 and 196.

[30] Exhibit 182, pp. 154 to 156, 196 to 198.

[31] Recommendation 8.17.

[32] This Recommendation was also supported by the Ontario Association of Architects, Brief 81, p. 3.

[33] Briefs 14 and 35; Transcript, Volumes 32 and 57.

[34] Brief 35; Transcript, Volume 57, pp. 53 and following.

Epilogue

In my view, the very fact of the existence of the Inquiry allows one to be optimistic about improved fire safety. Dr. John Bryan said, "I think [fire safety] already has been improved. . .you are having [this Inquiry] now rather than ten years in the future, that's progress." The Inquiry provided a forum for interaction among those concerned with fire safety. It was apparent to me that many projects were in their developmental stage prior to the Inquiry. I believe the Inquiry was a catalyst which prompted further progress. Other projects were really not being advanced with any urgency. The Inquiry caused those involved with those projects to reassess their priorities.

This report is the tangible or direct result of the Inquiry process. If the report meets the expressed goals of the Order-in-Council in some small way, it will have been beneficial.

The method chosen to discuss and draw together the many issues can be viewed with satisfaction. Dr. John Bryan commented upon the value of the Inquiry method:

> "I wish to congratulate the government of Ontario, and you all as Canadian citizens, for the enlightened attitude in having such an inquiry and a study of the problem.
>
> We have no such regional or national studies in the States to this extent, and the way you are going about it. . .you are to be congratulated on not only attacking the problem, but the manner in which you are attacking it is what impresses me."

I am optimistic for the future. Many owners of highrise buildings are now upgrading fire safety systems. Improved building systems will be more reliable if maintained as required by the Ontario Fire Code. More emphasis on the human aspects of fire safety as contemplated by the OFC and my recommendations will, in my view, improve fire safety in highrise buildings.

I foresee a continuous interaction of enlightened legislative change, increased construction competence, superior equipment and improved maintenance practices, and a new emphasis on fire safety planning, as the new base for improved fire safety.

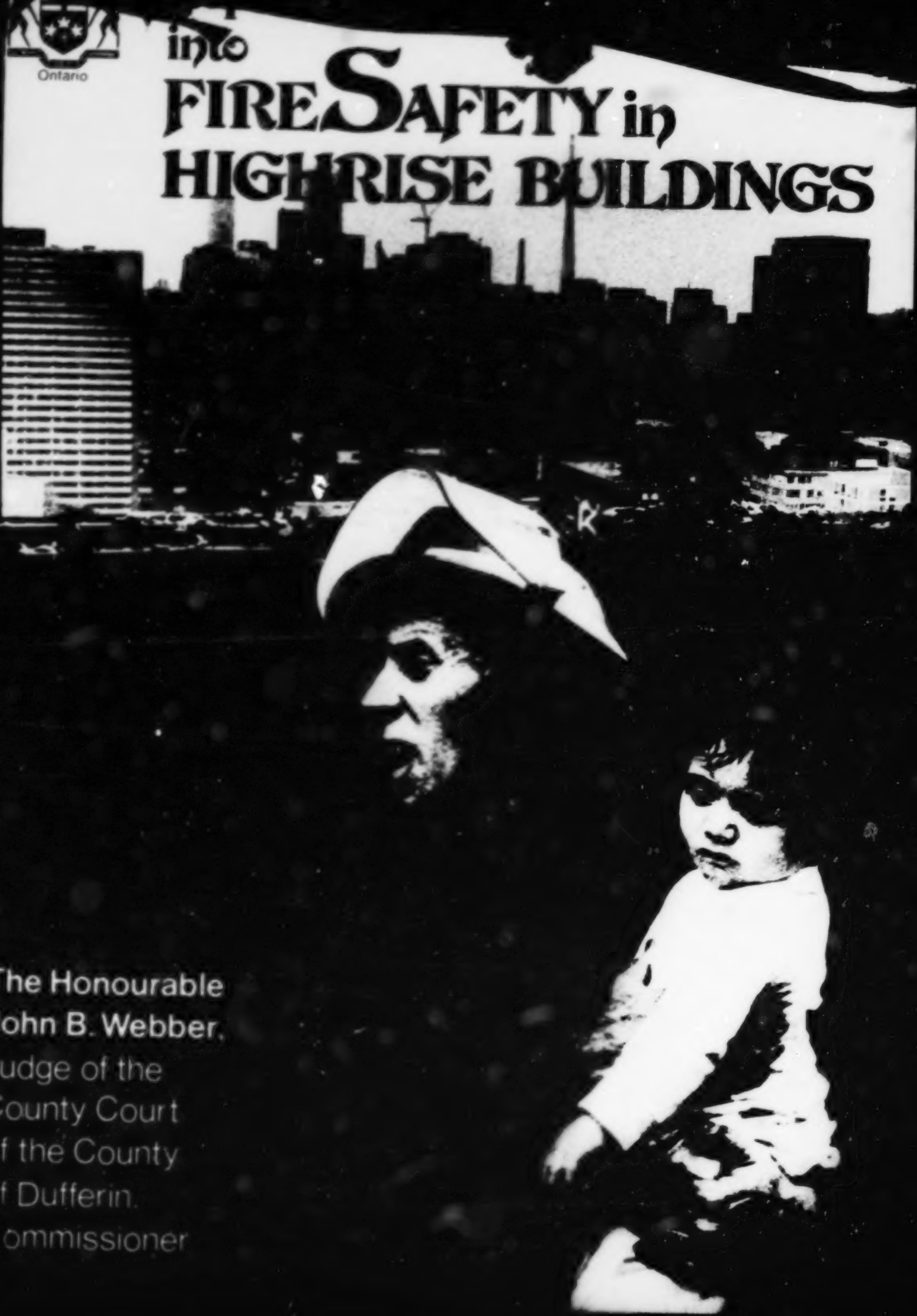
I believe some satisfaction can be expressed about the existing state of fire safety, even with the many deficiencies which I have noted. Human beings have been and will continue to be adaptive. They can and will react to the changed environment of a fire emergency. The future holds great promise if the development I have observed and predicted continues. It perhaps now can be said that people will, if they make the effort, be able to answer the question, "what do I do in a highrise fire?".

Volume

2

Ontario

into FIRE SAFETY in HIGHRISE BUILDINGS



The Honourable
John B. Webber,
Judge of the
County Court
f the County
f Dufferin,
ommissioner

Ontario

REPORT OF THE PUBLIC INQUIRY INTO FIRE SAFETY IN HIGHRISE BUILDINGS

The Honourable John B. Webber
Judge of the County Court of the County of Dufferin
Commissioner

December 1983

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PART A: RELATED TO HEARINGS

Appendix A.1

LIST OF HEARING DAYS, WITNESSES, AND EXHIBITS SUBMITTED

September 13, 1982	Opening Session	
Day 1 November 1, 1982	Roy Philippe Office of the Fire Marshal of Ontario	Volume 1 Exhibits #3-22
Day 2 November 2, 1982	Roy Philippe	Volume 2 Exhibits #23-24
Day 3 November 3, 1982	Roy Philippe	Volume 3 Exhibits #25-32
Day 4 November 15, 1982	Roy Philippe	Volume 4 Exhibits #33-37
	Earl Hunter President, Toronto Building Superintendents Association	Exhibit #38
Day 5 November 16, 1982	Antonio Chow Office of the Fire Marshal of Ontario	Volume 5 Exhibits #39A-39F, 40-41
Day 6 November 17, 1982	William Wretham Fire Chief, Borough of Scarborough	Volume 6 Exhibits #42-44
Day 7 November 18, 1982	William Wretham	Volume 7 Exhibits #45-46
Day 8 November 22, 1982	William Wretham	Volume 8 Exhibits #47-48
	Joseph Gibson Fire Chief, City of North York	
Day 9 November 23, 1982	Joseph Gibson	Volume 9 Exhibits #49-51
	John Hess Office of the Fire Marshal of Ontario	Exhibits #52-56
Day 10 November 24, 1982	John Hess	Volume 10 Exhibit #57 (Changed to 57A-C See Day 17)
Day 11 November 25, 1982	John Hess	Volume 11 Exhibits #58-59

Day 12 November 29, 1982	John Hess	Volume 12 Exhibits #60-66, 68-70
Day 13 November 30, 1982	William Goff President, PTE Industries Inc.	Volume 13 Exhibits #72-74
	Haim Zah Vice-President, PTE Industries Inc.	Exhibit #75
	Dr. Lorne Gold Associate Director, Division of Building Research, National Research Council of Canada	Exhibits #76-84
Day 14 December 1, 1982	George T. Tamura Senior Research Officer Energy and Services Section Division of Building Research, National Research Council of Canada	Volume 14 Exhibits #85-87
Day 15 December 2, 1982	George T. Tamura	Volume 15 Exhibit #88
Day 16 December 9, 1982	George T. Tamura	Volume 16 Exhibit #89
	John Hess	Exhibits #67, 91-93, 95-96
	Joseph Gibson	Exhibit #90
Day 17 December 13, 1982	John Hess	Volume 17 Exhibits #57A-57C, 97-98
	Peter Gathercole Office of the Fire Marshal of Ontario	Exhibits #100-105, 106A, B, C, K, F, 107
Day 18 December 15, 1982	Peter Gathercole	Volume 18 Exhibit #106D, E, G, H, I, J, L, M, N, O
Day 19 December 16, 1982	Peter Gathercole	Volume 19 Exhibits #108-110
Day 20 January 4, 1983	Peter Gathercole	Volume 20 Exhibits #111-112
	Thomas Gordon Smith Director, Elevating Devices Branch, Technical Standards Division, Ministry of Consumer and Commercial Relations (Ontario)	Exhibits #113-114

Day 21 January 5, 1983	Edmund Moores Tuff Chairman, Canadian Standards Association, B44 Committee (Elevator Safety Code)	Volume 21 Exhibits #115-116
	Graham Adams Director, Building Code Branch, Ministry of Consumer and Commercial Relations (Ontario)	Exhibit #117
Day 22 January 6, 1983	Graham Adams	Volume 22 Exhibits #118-122
Day 23 January 10, 1983	Graham Adams	Volume 23 Exhibits #123-129
Day 24 January 17, 1983	Graham Adams	Volume 24 Exhibits #130-134
	Christopher Fillingham (brief 75) Associate and General Manager, Dunlop, Farrow, Aitken, Architects	Exhibit #135
Day 25 January 18, 1983	Dr. Richard Viau Chief, Flammability Hazards Division, Product Safety Branch, Department of Consumer and Corporate Affairs (Canada)	Volume 25 Exhibits #136-139
Day 26 January 19, 1983	Christopher Fillingham	
Day 27 January 29, 1983	Grant E. Davidson Chief Electrical Inspector, Ontario Hydro	Volume 27 Exhibits #140-142
Day 28 January 27, 1983	Christopher Fillingham	Volume 28 Exhibits #119 (revision), 145
Day 29 January 31, 1983	Edward Munro (Brief 44) Canadian Portland Cement, Ontario Region	Volume 29 Exhibit #146
	Mark Patamia (Brief 57) Executive Director, Ontario Concrete Block Association	Exhibits #147-148
	Mrs. Elsie Stiles (Brief 10) Apt. PH2, 1515 Lakeshore Rd. E. Mississauga	

	Patrick J. DeFazio (Brief 40) **Firefighter** **Ottawa Fire Department**	
	Larry D. Simonato (Brief 63) **Director,** **Planning and Enforcement Services,** **City of Cambridge**	
Day 30 **February 1, 1983**	**Lyle L. MacLennan** **(Brief 54)** **Fire Chief,** **City of Ottawa**	**Exhibit #192** **(See Day 42)**
	Ronald W. Wheeler **(Brief 39)**	
	Mark Waxer) **and)(Brief 21)** **Karen Eluk)** **Third Degree Prevention Ltd.**	
	Christopher Cornish **(Brief 79)** **President,** **Roxborough Developments Ltd.**	**Volume 30** **Exhibit #149**
Day 31 **February 2, 1983**	**Christopher Cornish**	**Volume 31** **Exhibit #150**
	George A. Coleman **(Brief 58)** **General Manager,** **Housing Division and Homes for the Aged,** **Metropolitan Toronto Housing Company Ltd.**	**Exhibits #152-153**
	Ronald Douglas Brown **(Brief 48)**	
	Gerhard Jurgen Landmesser **(Brief 59)** **President,** **Canadian Fire Alarm Association.**	
Day 32 **February 3, 1983**	**Gerhard Jurgen Landmesser**	
	Paul Meleta (Brief 78) **Quality Control Inspector,** **Building Department,** **Borough of Scarborough**	
	Gerry Stephan (Brief 14) **President,** **Help Products Limited**	

Day 33 February 7, 1983	Paul Meleta	Volume 33 Exhibits #154A-154D, 155A, 156A-156B, 157 (For 155B–See Day 59)
	Donal Baird (Brief 42) Director, Fire Underwriters Survey, Insurance Bureau of Canada	Exhibit #158
	Douglas J. Beesley General Manager, Ontario Housing Corporation	Exhibits #159-166
Day 34 February 8, 1983	Douglas J. Beesley	Exhibit #167 (See Day 42)
	Graham Adams, Director, Building Code Branch, Ministry of Consumer and Commercial Relations (Ontario)	
	Peter L.E. Goering (Brief 5) Architect	Exhibit #168
Day 35 February 9, 1983	Byron M. Johnson (Brief 61) President, Springfield Environmental Research Ltd.	Volume 35 Exhibit #169
Day 36 February 10, 1983	Gerhard Granek (Brief 15) Principal, The ECE Group Ltd. Mechanical/Electrical Consulting Engineers	Volume 36 Exhibit #170
Day 37 February 14, 1983	Jake (J.L.) Pauls, Sr. Research Officer Bio-Medical Engineering Section, National Research Council of Canada	Volume 37 Exhibits #171-172
Day 38 February 15, 1983	Jake (J.L.) Pauls	
	Jack Hastings Manager, Safety Section Employee Advisory Service Branch, Ministry of Government Services (Ontario)	Volume 38 Exhibits #173-177
Day 39 February 16, 1983	John Russell Bateman Fire Marshal for the Province of Ontario	Volume 39 Exhibits #178-180
Day 40 February 28, 1983	Dr. John L. Bryan Professor and Chairman Fire Protection Engineering Department, University of Maryland	Volume 40 Exhibits #181-184

Day 41 March 1, 1983	Dr. Ann Cavoukian Research Analyst, Ministry of the Attorney General (Ontario)	Volume 41 Exhibit #185
Day 42 March 3, 1983	Rudy Palladina (Brief 42) Regional Marketing Manager, Bell Helicopter Textron	Volume 42 Exhibits #194-197
	Rick Gerundin Ontario Provincial Police	
	Paul Hirst Kevill (Brief 30) Society of Fire Protection Engineers, Southern Ontario Chapter	
	Christopher C. Hart (Brief 30) Director of Legal Services, Association of Professional Engineers of Ontario	Exhibits #198A-198D
	Alan James Hill (Brief 30) Society of Fire Protection Engineers	
Day 43 March 7, 1983	Norman Pearce (Brief 17) Vice-President and Chief Engineer, Underwriters' Laboratories of Canada	Volume 43 Exhibits #199-205
	Christopher C. Hart (Brief 17)	
	Jack McFadden (Brief 17) Chief Fire Prevention Officer, City of Toronto	Exhibits #206-208
	William Sproule (Brief 17) Assistant Deputy Fire Chief, City of Toronto	
Day 44 March 8, 1983	William Sproule	Volume 44 Exhibits #209-210
	Bernard Bonser (Brief 17) Fire Chief, City of Toronto	
Day 45 March 9, 1983	Rashmi Nathwani (Brief 17) Deputy Chief Building Official and Director of Plan Examination, City of Toronto	Volume 45 Exhibits #211-218
Day 46 March 10, 1983	Rashmi Nathwani	
	Michael Nixon (Brief 17) Chief Building Official City of Toronto	

	Charles Greenberg (Brief 17) Director of Practice, Ontario Association of Architects	Volume 46 Exhibit #219
Day 47 March 14, 1983	Christopher Fillingham (Brief 75) Associate and General Manager, Dunlop, Farrow, Aitken, Architects	Volume 47 Exhibit #220
	Robert T. Myles (Brief 75) Vice-President, Hanscomb Consultants Inc. Cost Accountants	Exhibits #221-223
Day 48 March 15, 1983	Robert T. Myles	
	Christopher Fillingham	
	John Bassel (Brief 75) President, Metropolitan Toronto Apartment Builders' Association	
Day 49 March 16, 1983	John Bassel	Volume 49 Exhibit #224
	Robert T. Myles	Exhibit #225
Day 50 March 17, 1983	Marvin Sadowski (Brief 75) Chairman, Management Group of the Apartment Group, Urban Development Institute	Volume 50 Exhibits #227-233
Day 51 April 5, 1983	Donald J. Boehmer (Brief 77) Vice-President and Manager Rolf Jensen and Associates, Consulting Fire Protection Engineers	Volume 51 Exhibits #20A, 234-236
Day 52 April 6, 1983	Donald J. Boehmer	
	Jack Gringorten Senior Vice-President, Property Administration of Office Buildings, Olympia and York Developments	Volume 52 Exhibits #237-239
Day 53 April 12, 1983	Jack Gringorten	Volume 53 Exhibit #241
Day 54 April 12, 1983	George V. Tatham (Exhibit 34) Senior Vice-President, Oxford Development Group Limited, Canadian Division	Volume 54 Exhibits #242-246

Day 55 April 13, 1983	John W. Fothergill (Brief 4) Principal, Integrated Systems Incorporated Brunswick, Maryland	Volume 55 Exhibits #247-248
	Harry Shaw (Brief 4) Fire Protection Consultant Rockville, Maryland	Exhibits #188A, 249-256
Day 56 April 14, 1983	Walter William Miller (Brief 4) Vice-President Wormald Fire Systems	Volume 56 Exhibit #257
	Douglas Howes (Brief 4) Vice-President, Bennett & Wright (Ret.) Mechanical Contractors	Exhibits #258-259
	Alvin McBride (Brief 4) Business Manager, U.A. Local 853 Sprinkler Fitters of Ontario	Exhibit #260
	William Kennally (Brief 4) Director of Information, Canadian Automatic Sprinkler Association	Exhibits #261-264
Day 57 April 18, 1983	John Haunts (Brief 25) Fire Safety Committee, Ontario Hotel and Motel Association	Volume 57
	Russell W. Cooper (Brief 25) Executive Director, Ontario Hotel and Motel Association	
	David Charles Moulds (Brief 35) Safety Supply Canada	
Day 58 April 19, 1983	Junie Boudreau (Brief 33) Member, Regent Park Residents Association	
	Fred Bever (Brief 33) Community Legal Worker, Parkdale Legal Services	Volume 58 Exhibits #265-267
	Dale Martin (Brief 33) Chairperson, Federation of Metropolitan Toronto Tenants' Associations	Exhibit #268
Day 59 April 26, 1983	J.A. Euclid Herie (Brief 76) Executive Director, Canadian National Institute for the Blind	Volume 59 Exhibits #269-270

	Mrs. Joyce Thompson (Brief 76) Case Manager, Deaf/Blind Services, and Orientation and Mobility Instructor, Canadian National Institute for the Blind	
	Ronald Bowman (Brief 29) Executive Vice-President, Ontario Professional Fire Fighters Association	
Day 60 April 27, 1983	George Fleming (Brief 78) Building Commissioner, Borough of Scarborough	Volume 60 Exhibits #282-285
Day 61 May 2, 1983	David Hodgson Director, Building Code Branch Ministry of Municipal Affairs and Housing (Ontario)	Volume 61 Exhibit #130 (replacement)
	Roy Philippe Office of the Fire Marshal of Ontario	Exhibits #286-289
	John Hess Office of the Fire Marshal of Ontario	Exhibits #56A, 290-294

* * * SUBMISSIONS * * *

Day 62 May 24, 1983	Victor L. Freidin Counsel to the Commission
Day 63 May 25, 1983	Victor L. Freidin
Day 64 May 29, 1983	Victor L. Freidin
	Karl Jaffary, Q.C. Counsel for HUDAC, UDI & MTABA
	B.S. Onyschuk, Q.C. Counsel for CIPREC, ICSC & BOMA
Day 65 May 31, 1983	Demir Delen, P.Eng. for the City of Toronto
Day 66 June 1, 1983	Theresa Kowalishin Counsel for the City of Toronto
Day 67 June 6, 1983	William Kennally for the Canadian Automatic Sprinkler Association
	Victor L. Freidin (reply)

SUPPLEMENTARY LIST OF EXHIBITS SUBMITTED THROUGH COMMISSION COUNSEL

Opening Session September 13, 1982	Exhibits # 1-2
Day 14 December 1, 1982	Volume 14 Exhibit # 51 (index)
Day 16 December 9, 1982	Volume 16 Exhibit # 94
Day 17 December 13, 1982	Volume 17 Exhibit # 99
Day 21 January 5, 1983	Volume 21 Exhibit # 86A
Day 28 January 27, 1983	Volume 28 Exhibits # 143-144
Day 31 February 2, 1983	Volume 31 Exhibit # 151
Day 42 March 3, 1983	Volume 42 Exhibits # 167,186-193
Day 50 March 17, 1983	Volume 50 Exhibits # 193(a), 226
Day 53 April 7, 1983	Volume 53 Exhibit # 240
Day 54 April 12, 1983	Volume 54 Exhibit # 160A
Day 59 April 26, 1983	Volume 59 Exhibits # 98, 155B, 271-281
Day 61 May 2, 1983	Volume 61 Exhibits # 295-296
Day 62 May 24, 1983	Volume 62 Exhibits # 297-312
Day 66 June 1, 1983	Volume 66 Exhibit # 313

ADDITIONAL DOCUMENTS MADE EXHIBITS AFTER CLOSE OF HEARINGS

Exhibit #314
Exhibit #315
Exhibit #316

Appendix A.2

LIST OF PARTICIPANTS WITH STANDING

Bell Helicopter Textron

Berhold Investments Ltd.

Building Owners and Managers Association

Canadian Automatic Sprinkler Association

Canadian Institute of Public Real Estate Companies

City of Toronto

Federation of Metropolitan Toronto Tenants' Associations

Housing and Urban Development Association of Canada (Ontario Council)

International Council of Shopping Centres, Canadian Committee

Metropolitan Toronto Apartment Builders' Association

Ontario Association of Fire Chiefs

Ontario Hotel and Motel Association

Ontario Professional Fire Fighters Association

PTE Industries Inc.

Safety Supply Canada

Society of Fire Protection Engineers, Southern Ontario Chapter

Unitronex Constructors Ltd.

Urban Development Institute, Apartment Group

Mr. Lewis V. Vaughan, P.Eng.

Appendix A.3A

NUMERICAL LIST OF BRIEFS (* Those granted standing)

No.	Submission made by
1.	Mr. J. H. McGuire
2.	Mr. George W. Copeland, Q.C.
3.	Dr. and Mrs. Donald T. Wigle
4.	*Canadian Automatic Sprinkler Association
5.	Peter L. E. Goering, Architect
6.	Insurers' Advisory Organization of Canada
7.	Mr. Claude LeBlanc
8.	*PTE Industries Inc.
9.	Mr. Ken H. Newton
10.	Mrs. Elsie Stiles
11.	Mr. Nelson Brown
12.	Ms. Florence Veale
13.	Miss Myrtle E. Smith
14.	Help Products Ltd.
15.	The ECE Group Ltd., Consulting Engineers
16.	Newage Equipment Ltd.
17.	*City of Toronto
18.	Ms. Florence McLachlan
19.	City of Orillia Fire Department
20.	Ontario Building Officials Association Inc.
21.	Third Degree Prevention Ltd.
22.	Canadian Foundry Association. Cast Iron Soil Pipe Division
23.	*Unitronex (Electronics) Constructors Ltd.
24.	*Bell Helicopter Textron
25.	*Ontario Hotel and Motel Association
26.	*Ontario Association of Fire Chiefs
27.	U. A. Local 853, Sprinkler Fitters of Ontario
28.	*Berhold Investments Limited
29.	*Ontario Professional Fire Fighters Association
30.	*Society of Fire Protection Engineers (Southern Ontario Chapter)

No.	Submission made by
31.	Mr. & Mrs. Cecil W. Rose
32.	City of Sarnia, Chief Building Official
33.	*Federation of Metropolitan Toronto Tenants' Associations
34.	*Building Owners & Managers Association of Metropolitan Toronto (BOMA)
35.	*Safety Supply Canada
36.	Mr. Douglas M. DeHart
37.	Halton Condominium Corporation Number 77. Fire Safety Committee
38.	Town of Elliott Lake Fire Department
39.	Mr. R. W. Wheeler
40.	Mr. Patrick J. DeFazio, Firefighter, Ottawa Fire Department
41.	Hamilton Fire Department
42.	Insurance Bureau of Canada
43.	The State Electric Company Limited
44.	Canadian Portland Cement Association
45.	Toronto Building Superintendents' Association (TBSA)
46.	Mr. P. Frame
47.	Mr. Carl M. Lewis
48.	Mr. Ronald D. Brown
49.	City of Kitchener. Department of Planning & Development
50.	Carleton Condominium Corporation #25
51.	Gloucester Fire Department
52.	Canadian Association of Fire Chiefs Inc.
53.	The Fire Chiefs in the Municipality of Metropolitan Toronto
54.	Ottawa Fire Department
55.	Dupont Canada Inc.
56.	City of Mississauga Fire Department
57.	Ontario Concrete Block Association
58.	The Metropolitan Toronto Housing Company Ltd.
59.	Canadian Fire Alarm Association
60.	City of Windsor. Office of the Clerk
61.	Rehabilitation Institute of Ottawa
62.	Regent Park Residents Association
63.	City of Cambridge. Planning & Enforcement Services
64.	City of Guelph Fire Department
65.	Province of Manitoba. Office of the Fire Commissioner
66.	Province of Saskatchewan. Department of Labour and Manpower
67.	Province of New Brunswick. Department of Labour and Manpower

68. Fire Commissioner of Canada
69. Fire Prevention Canada (FIPRECAN) Association
70. Province of British Columbia. Office of the Fire Commissioner
71. City of Peterborough. City Administrator's Office
72. City of London. Department of City Clerk
73. Mrs. Dorothy Beckett
74. Ontario March of Dimes,
    and The Muscular Dystrophy Association of Canada
75. *Urban Development Institute. Apartment Group
    *Metropolitan Toronto Apartment Builders' Association
    *Housing & Urban Development Association of Canada, Ontario Council
76. The Canadian National Institute for the Blind, Ontario Division
77. *The Canadian Institute of Public Real Estate Companies
78. G. H. Fleming, P.Eng.
79. Roxborough Development Limited
80. City of North York. Building Department
81. Ontario Association of Architects
82. Pyrotronics Canada Limited
83. City of Port Hope. Clerk-Administrator
84. Mr. Karl Haab
85. Pyrotenax of Canada Limited
86. The London Property Management Association (LPMA)
87. Province of Alberta. Office of the Fire Commissioner
88. Town of Whitby Fire Department
89. Ontario Municipal Fire Prevention Officers Association
90. Canadian Condominium Institute
91. Sid Shear Limited
92. Pennwalt of Canada Ltd.
93. Mr. R. B. Pierce (Safescape)

Appendix A.3B

BRIEFS BY AUTHOR : INDIVIDUALS

Brief No.	Name
73	Mrs. Dorothy Beckett
11	Mr. Nelson Brown
48	Mr. Ronald D. Brown
2	Mr. George W. Copeland, Q. C.
36	Mr. Douglas M. DeHart
78	Mr. G. H. Fleming, P.Eng.
46	Mr. P. Frame
5	Mr. Peter L. E. Goering
84	Mr. Karl Haab
7	Mr. Claude LeBlanc
47	Mr. Carl M. Lewis
1	Mr. J. H. McGuire
18	Ms. Florence McLachlan
9	Mr. Ken H. Newton
31	Mr. and Mrs. Cecil W. Rose
13	Miss Myrtle E. Smith
10	Mrs. Elsie Stiles
12	Ms. Florence Veale
39	Mr. R. W. Wheeler
3	Dr. and Mrs. Donald T. Wigle

BRIEFS BY AUTHOR: ORGANIZATIONS/ASSOCIATIONS

(*Those granted standing)

Brief No.	Name
34	*Building Owners & Managers Association of Metropolitan Toronto (BOMA)
52	*Canadian Association of Fire Chiefs
4	*Canadian Automatic Sprinkler Association
90	Canadian Condominium Institute
59	Canadian Fire Alarm Association
22	Canadian Foundry Association. Cast Iron Soil Pipe Division
77	*The Canadian Institute of Public Real Estate Companies
76	The Canadian National Institute for the Blind, Ontario Division
44	Canadian Portland Cement Association
33	*Federation of Metropolitan Toronto Tenants' Associations
53	The Fire Chiefs in the Municipality of the City of Toronto
69	Fire Prevention Canada (FIPRECAN) Association
75	*Housing and Urban Development Association of Canada, Ontario Council
42	Insurance Bureau of Canada
6	Insurers' Advisory Organization of Canada
36	The London Property Management Association (LPMA)
75	*Metropolitan Toronto Apartment Builders' Association
74	Muscular Dystrophy Association of Canada
81	Ontario Association of Architects
26	*Ontario Association of Fire Chiefs
20	Ontario Building Officials Association Inc.
57	Ontario Concrete Block Association
25	*Ontario Hotel & Motel Association
74	Ontario March of Dimes
89	Ontario Municipal Fire Prevention Officers Association
29	*Ontario Professional Fire Fighters Association
62	Regent Park Residents Association
61	Rehabilitation Institute of Ottawa
30	*Society of Fire Protection Engineers (Southern Ontario Chapter)
45	Toronto Building Superintendents' Association
27	U. A. Local 853, Sprinkler Fitters of Ontario
75	*Urban Development Institute. Apartment Group

BRIEFS BY AUTHOR: GOVERNMENTS: MUNICIPAL, PROVINCIAL & NATIONAL

(* Those granted standing)

Brief No.	Name
68	Fire Commissioner of Canada
63	City of Cambridge. Planning and Enforcement Services
49	City of Kitchener. Department of Planning and Development
72	City of London. Department of City Clerk
80	City of North York. Building Department
71	City of Peterborough. City Administrator's Office
32	City of Sarnia. Chief Building Official
17	*City of Toronto
70	Province of British Columbia. Office of the Fire Commissioner
65	Province of Manitoba. Office of the Fire Commissioner
67	Province of New Brunswick. Department of Labour and Manpower
66	Province of Saskatchewan. Office of the Fire Commissioner
83	Town of Port Hope. Clerk-Administrator

BRIEFS BY AUTHOR : FIRE DEPARTMENTS
(* Those granted standing)

Brief No.	Name
51	Gloucester Fire Department
64	Guelph Fire Department
41	Hamilton Fire Department
56	City of Mississauga Fire Department
19	City of Orillia Fire Department
54	Ottawa Fire Department
60	City of Windsor. Office of the Clerk
40	Mr. Patrick J. DeFazio, Firefighter, Ottawa Fire Department
38	Town of Elliot Lake Fire Department
88	Town of Whitby Fire Department

BRIEFS BY AUTHOR: PRIVATE FIRMS
(* Those granted standing)

Brief No.	Name
24	*Bell Helicopter Textron
28	*Berhold Investments Ltd.
50	Carleton Condominium Corporation #25
55	Dupont Canada Inc.
15	The ECE Group Limited, Consulting Engineers
37	Halton Condominium Corporation #77. Fire Safety Committee
14	Help Products Ltd.
58	Metropolitan Toronto Housing Company Ltd.
16	Newage Equipment Ltd.
8	*PTE Industries Inc.
82	Pyrotronics Canada Ltd.
79	Roxborough Development Limited
35	*Safety Supply Canada
91	Sid Shear Limited
43	The State Electric Company Limited
21	Third Degree Prevention Ltd.
23	*Unitronex (Electronics) Constructors Ltd.
92	Pennwalt of Canada Ltd.
93	Mr. R.B. Pierce (Safescape)
85	Pyrotenax of Canada Ltd.

Appendix A.4A

WITNESSES CALLED BY COMMISSION COUNSEL

Mr. Graham Adams
Mr. John R. Bateman
Mr. Douglas Beesley
Dr. John L. Bryan
Dr. Ann Cavoukian
Mr. Antonio Chow
Mr. Grant E. Davidson
Mr. Christopher T. Fillingham
Mr. Peter Gathercole
Mr. Joseph Gibson
Mr. Peter L.E. Goering
Dr. Lorne Gold
Mr. Gerhard Granek
Mr. John Hastings
Mr. John Hess
Mr. David Hodgson
Mr. Byron M. Johnson
Mr. Jake (J.L.) Pauls
Mr. Roy Philippe
Mr. Thomas Gordon Smith
Mr. George T. Tamura
Mr. Edmund Moores Tuff
Dr. Richard Viau
Mr. William Wretham

Appendix A.4B

QUALIFICATIONS OF WITNESSES CALLED BY COMMISSION COUNSEL

Name:	**Graham Adams**
Present Position:	Director* Building Code Branch, Ministry of Consumer and Commercial Relations (Ontario)
Education:	University of Toronto (1952) Degree: Bachelor of Architecture
Memberships: (past & present)	Royal Architectural Institute of Canada Ontario Association of Architects Canadian Institute of Planners Revision Committee on Administration of the ACNBC (1958-1960) Standing Committee on Residential Standards of the ACNBC Associate Committee and Executive Committee on the National Fire Code Provincial Advisory Committee on the National Building Code (Vice-Chairman, 1981-1983) ACNBC Task Group on High Buildings CMHC Task Group on National Building Materials Evaluation System
Experience:	
1952-1955	Private Architectural Practice
	Government of Ontario
1955-1960	Department of Planning and Development, Community Planning Branch
1960-1962	Supervisor of Zoning
1962-1966	Supervisor of Subdivision Approvals Section
1966-1970	Head of Extension and Field Services, Community Planning Branch (Municipal Affairs)
1970-1975	Director, Uniform Building Standards Branch
1976-1983	Director, Building Code Branch

*On February 1, 1983, The Building Code Branch was transferred to the Ministry of Municipal Affairs and Housing, and David Hodgson undertook the duties of Director.

Name:	**John R. Bateman**
Present Position:	Fire Marshal of Ontario
Education:	University of Toronto (1957) Degree: Bachelor of Applied Science, Engineering and Business
Memberships: (past & present)	National Fire Protection Association Society of Fire Protection Engineers Canadian Fire Safety Association Association of Professional Engineers of Ontario Fire Test Board of National Building Code Associate Committee on the National Fire Code
Experience:	
1963-1975	Assistant Chief Engineer of Fire Engineering Section, Office of the Fire Marshal
1975-1977	Deputy Fire Marshal of Ontario
1977-present	Fire Marshal of Ontario

Name:	**Douglas J. Beesley**
Present Position:	General Manager, The Ontario Housing Corporation
Education:	University of Toronto (1957) Degree: Bachelor of Applied Science (Civil Engineering)
Memberships:	Association of Professional Engineers of Ontario Fellow of the Institute of Housing Management
Experience:	
1961-1964	Ontario Department of Economics, Branch Engineer
1964-present	Ontario Housing Corporation

Name:	**Dr. John L. Bryan**
Present Position:	Professor and Chairman of the Fire Protection Engineering Department, University of Maryland
Memberships: (past & present)	Safety to Life Committee, NFPA 101 (Life Safety Code) Subcommittee on Means of Egress, NFPA 101 (Life Safety Code) American Association for the Advancement of Science National Fire Protection Association Society of Fire Protection Engineers American Society for Engineering Education Chesapeake Chapter, Society of Fire Protection Engineers Committee E-5, Fire Tests, American Society for Testing and Materials American Association of University Professors Fire Council, Underwriters' Laboratories, Inc.
Experience: (selected)	
1956	Flynn and Emrich Co.
1960-1965	Explosion and fire investigation and preventive recommendations. United States Coast Guard

1965-1966	Consultant to American Iron and Steel Institute
1970-1972	Consultant to Fire Protection and Safety Engineering Committee, Federal Construction Council
1956-present	Professor and Chairman of Fire Protection Engineering Department, University of Maryland
	Twenty-two years of paid and volunteer fire department experience

Publications:
(selected)

1958	Psychology of Panic
1970	Motivation and Attitude Formation in Relation to Fire Prevention
1975	Human Behaviour in the Fire Situation
1977	Smoke as a Determinant of Human Behaviour in Fire Situations (Project People)
1978	Human Behaviour in Fire; a Bibliography
1979	Human Behaviour in a Hospital Fire
1980-81	The Determination of Behaviour Response Patterns in Fire Situations (Project People II)
1980	An Examination and Analysis of the Dynamics of the Human Behaviour in the MGM Grand Hotel
1982	Human Behaviour in the MGM Grand Hotel
1982	Implications for Codes & Behaviour Models from the Analysis of Behaviour Response Patterns in Fire Situations as selected from the Project People and Project People II Study Programs

Name: **Dr. Ann Cavoukian**

Present Position: Research Analyst

Education: University of Toronto (1980)
Degree: PhD (Psychology)

Experience:

1981	Attorney General for the Province of Ontario Research Analyst
1981	Task Force on Vandalism Research Consultant

Publications:
(Selected)

1978	Evaluation of a Delinquency Prevention Program: Lifeline
1979	An Examination of the concept of Juvenile Diversion
1980	The Admissibility of Polygraph Evidence in a Court of Law: Some Empirical Findings (with Ronald Heslegrave)
1980	Determinants of Behavioural Contagion: Density and the Number of People (with Jonathan Freedman and Joanna Birsky)
1983	High Rise Fire Safety; Questionnaire Conducted in Apartment Buildings and Hotels.

Name:	**Antonio Chow**
Present Position:	Acting Assistant Chief of Consulting Services, Office of the Fire Marshal (Ontario)
Education:	Brixton School of Building Hammersmith College (1962) Civil Engineer: U.K.
Memberships: (past & present)	Association of Professional Engineers of Ontario Institution of Structural Engineers of Great Britain
Experience:	
1964-1967	Structural Engineer, England & Hong Kong
1967-1970	Structural Engineer, Ontario
1970-1977	Plans Examination and Approval, City of Toronto Building Department
1977-1982	Plans Examination and Approval Office of the Fire Marshal

Name:	**Grant E. Davidson**
Present Position:	Chief Electrical Inspector, Ontario Hydro
Education:	University of Toronto (1943) Degree: Bachelor of Applied Science (Electrical Engineering)
Memberships:	Association of Professional Engineers of Ontario Chartered Institution of Building Services (U.K.) (Fellow)
Experience:	
1946-1971	Research division (radiation optics) (Ontario Hydro)
1971-1976	Supervising electrical inspection engineer, Electrical Inspection Department (Ontario Hydro)
1977-present	Chief Electrical Inspector, Ontario Hydro

Name:	**Christopher T. Fillingham**
Present Position:	Associate and General Manager; Dunlop Farrow, Aitken*
Education:	University of Toronto, (1968) Degree: Bachelor of Architecture
Memberships: (past & present)	Ontario Association of Architects Royal Architectural Institute of Canada Canadian Fire Safety Association Standing Committee on Fire Safety in Buildings, for the National Fire Code, Part 2.6.7 Ontario Fire Code Advisory Committee Joint Construction Council of UDI/MTABA (Chairman) Task Group preparing requirements for Fire Fighter Access to Buildings for National Building Code (Chairman) Advisory Committee to the Ministry of Municipal Affairs and Housing on the Renovation Requirements (Part Eleven of the OBC)

High Rise Task Group of the Use and Occupancy Committee of the National Building Code
Ontario Fire Code Task Group on Part 9 — Retrofit (Chairman of the Health Care Facilities Committee of the Task Group)
National Fire Protection Association
Part 3 Use and Occupancy Standing Committee of the National Building Code

Experience:	
1968-1969	Architect with Harry P. Smith, Kingston
1969-1971	Architect with Yamazaki & Greig, Toronto
1971-1972	Partner of Integrated Management Planning
1972-1981	Architect with Dunlop, Farrow, Aitken
1981-present	Associate and General Manager, Dunlop, Farrow, Aitken

*On July 1, 1983 Mr. Fillingham became a partner of Dunlop, Farrow, Aitken, Cansfield.

Publications:

1974-1975 Co-author of reports entitled:

- A Study of the Additional Requirements for High Buildings Proposed in Change Series No. 3 to N.B.C. Subsection 3.2.6.
- A Study of the Requirements contained in the Second Edition of the National Fire Code of Canada, Part 2, Building and Occupant Fire Safety; Draft for Public Comment
- A Report on the Implications of the Requirements for Access for the Handicapped contained in Builders' Bulletin No. 243 issued by C.M.H.C., April 17, 1975

1981-1982

- A Study of the Additional Requirements for New High Commerical Buildings for the Building Code Branch of the Ministry of Consumer and Commercial Relations, Province of Ontario

Name: **Peter Gathercole**

Present Position: Investigation Services
Office of the Fire Marshal

Education: Rotherham College of Technology & Art,
Rotherham, England (1950)
Degree: Higher National Certificate in Mechanical Engineering (1950)
North Staffordshire College of Technology,
Stoke-On-Trent, Staffordshire, England (1952)
Degree: Ordinary National Certificate in Electrical Engineering
Derby College of Technology & Art,
Derbyshire, England (1954)
Degree: Higher National Certificate in Electrical Engineering

Membership:	Association of Professional Engineers of Ontario
Experience:	
1950-1952	English Electric Company Limited, Stafford, England.
1952-1954	Rolls-Royce Limited, Derby, England,
1955-1959	Orenda Engines Limited, Malton, Ontario. Test Engineer.
1959-1962	Rover Company Limited, Solihull, England. Development Engineer.
1962-1968	Orenda Engines Limited, Malton, Ontario. Design, test, and development engineer.
1968-to date	Office of the Fire Marshal of Ontario.

— Plan examination for fire safety for hotels; colleges & universities; nursing homes

— Specialized studies involving high rise buildings

— Rendered technical assistance to the Fire Investigations Section of this Office in the investigation of fire and explosions, in all types of buildings and occupancies and in automobiles.

— Lectures on the principles of fire safety and protection in buildings and on electrical fire hazards, at the Ontario Fire College, the Canadian Fire Investigations School in Arnprior, Ontario, and at the Aylmer Police College.

Name:	**Joseph Gibson**
Present Position:	Fire Chief for the City of North York
Experience:	
1956-1962	Firefighter
1962-1972	Captain
1972-1975	District Chief
1975-present	Fire Chief for the City of North York

Name:	**Peter L. E. Goering**
Present Position:	Architect
Education:	University of Toronto (1955) Degree: Bachelor of Architecture
Memberships:	Royal Architectural Institute of Canada Ontario Association of Architects
Experience:	Private practice since 1971 Partner — Somerville, McMurich and Oxley Architects, 10 years Associate — Raymond Moriyama, Architects and Planners, 2 years Part-time Lecturer — University of Toronto (Architecture) — University of Waterloo (Architecture)
Papers presented:	
1971(London)	Royal Society
1972 (Stockholm)	International Council for Building Research and World Meteorological Organization

1973 (New York)	BRI Workshop (National Research Council, Washington, D.C.)
1974(Stuttgart)	Institute for Lightweight Structures
1976(Montreal)	WCOSE '76 (International Association of Spatial Structures)
1980(New Orleans)	International Association of Stadium Managers

Name: **Dr. Lorne Gold**

Present Position: Associate Director of the Division of Building Research, National Research Council of Canada

Education:
University of Saskatchewan (1950)
  Degree: Bachelor of Science (Engineering Physics)
McGill University (1952)
  Degree: Masters (Physics)
McGill University (1970)
  Degree: Ph.D. (Physics)

Research and Experience:

1953-1969	NRC — Division of Building Research, Ice & Snow Research Section
1969-1974	NRC — Division of Building Research, Head of Geotechnical Section
1974-1979	Assistant Director, Division of Building Research
1979-Present	Associate Director, Division of Building Research

Memberships: (past & present)
Association of Professional Engineers of Ontario
Engineering Institute of Canada
Canadian Geotechnical Society
Canadian Society for Civil Engineers
International Glaciological Society
Arctic Institute of North America
Affiliate of the Canadian Association of Physicists
International Glaciological Society (past President)
Associate Committee on Geotechnical Research (Chairman — 1976-1983)
Fellow of the Royal Society of Canada

Name: **Gerhard Granek, P. Eng.**

Present Position: Principal, The ECE Group Ltd.

Education:
University of Toronto (1948)
  Degree: Bachelor of Science (Honours)

Memberships: (past & present)
Association of Professional Engineers of Ontario
Association of Consulting Engineers of Canada
NRC Task Force, High Rise Life Safety
The Solar Institute
Urban Development Institute
CSA Committee on Environmental Control in Hospitals
Advisory Committee, Ryerson Institute

Experience:
Frost & Granek Associates, Consulting Engineers
Page & Steele, Architects

	Meschino & Associates, Consulting Engineers Bennett & Wright Ltd., Contractors Shore & Moffatt, Architects Hydro Electric Power Commission of Ontario
1955-present	Principal, The ECE Group Ltd. Part-time Lecturer to OAA Registration Course and Schools of Architecture at the University of Toronto and Carleton University
Publications: (Selected)	
1973	The Economics of Air Conditioning in Hospitals
1975	Learning to Cope with the Crisis of Energy and Economics in Our Hospitals
1975	Fire Management — 1975
1979	Design for Retrofit — Planning for Future Change

Name:	**John Hastings**
Present Position:	Manager of Safety Section, Employee Advisory Service Branch, Ministry of Government Services (Ontario)
Responsibilities:	Responsible for the occupational safety of government employees in government owned buildings and buildings leased by the government.
Employment History:	
1947-1967	Toronto Fire Department Firefighter; Captain
1967-1977	Safety Administrator Maple Leaf Mills
1977-1981	Safety Manager Ministry of Natural Resources (Ontario)
1981-present	Ministry of Government Services

Name:	**John Hess**
Present Position:	Co-ordinator of the Hotel Fire Safety Services Unit Office of the Fire Marshal (Ontario)
Responsibilities:	Administration of the Hotel Fire Safety Act including: — inspection of hotels (63 inspectors) — developing training programs for hotel staff — fire safety procedures and training — enforcement.
Experience:	
1959-1965	Scarborough Fire Department Firefighter; Fire Prevention Officer
1966-1968	T. Eaton Company, Fire Chief, Central Division
1968-1977	Ministry of Health for the Province of Ontario, Consultant in Fire Safety of Explosion Hazards (Ontario Hospital Services Commission)
1977-1979	Ministry of Government Services (Ontario) Supervisor of the Safety Section

1979-1981	Office of the Fire Marshal (Ontario) Supervisor of the Fire Protection Unit
1981-present	Co-ordinator, Hotel Fire Safety Services Unit; Office of the Fire Marshal (Ontario)

Name:	**David Hodgson**
Present Position:	Director, Building Code Branch, Ministry of Municipal Affairs and Housing (Ontario)
Education:	University of Western Ontario (1969) Degree: Bachelor of Arts (Economics)
Experience:	Deputy clerk for the Township of King Deputy town clerk for the Town of Oakville
1973-1975	Provincial Municipal Affairs Officer, Ministry of Treasury, Economics and Intergovernmental Affairs (Ontario) and the Provincial/Municipal Affairs Secretariat
1975-1982	Co-ordinator of intergovernmental policy for the Ministry of Municipal Affairs and Housing (Ontario)
1983-present	Director, Building Code Branch, Ministry of Municipal Affairs and Housing (Ontario)

Name:	**Byron M. Johnson**
Present Position:	President of Springfield Environmental Research Ltd.
Education:	University of Victoria, British Columbia (1971) Degree: Bachelor of Science (Mathematics) University of Edinburgh, Scotland (1975) Degree: Bachelor of Science (Architecture)
Memberships: (past & present)	National Centre for Barrier Free Environment National Task Force on Life Safety and the Handicapped Association for Preservation Technology International Council of Monuments and Sites (ICOMOS) Canada Heritage Canada Foundation American Society for the Testing of Materials (Committee E.6) International Standards Organization, Canada Advisory Committee, Tech. Com. 59, Sub-Com 3
Experience:	
1971-1972	Structural Engineering Division of the Commonwealth of Australia
1975-1979	Research Officer with the Division of Building Research of the National Research Council
1981-present	Associate with Harold D. Kalman, Consultant in the History and Conservation of Architecture

Publications: **(selected)**	
1977	User Requirements in Elevators
1977	Pilot Study on Personnel Movement in Office Building
1978	Movement of Crowds at Montreal Olympic Park
1978	Problems with Moving Patients in Buildings
1979	Survey of Activity Patterns in Two Government Office Buildings
1979	Accessible Pedestrian Systems for Those with Physical Disabilities
1980	Sorting-out Fire Exit versus Building Security Needs
1981	Door Use Study
1981	Patterns of Residential Occupancy
1981	Conflicting Requirements of Exit Doors
1983	Evacuation Techniques for Disabled Persons

Name:	**Jake (J. L.) Pauls**
Present Position:	Research Officer National Research Council of Canada, Ottawa
Education:	University of British Columbia (1969) Undergraduate studies: Honours Physics and Electrical Engineering Degree: Bachelor of Architecture
Memberships: (past & present)	National Building Code of Canada, Part 3 National Fire Code of Canada, Part 2 National Fire Code of Canada/National Building Code of Canada Ad Hoc Joint Working Group N.F.P.A. 101 (Life Safety Code) Subcommittee on Means of Egress National Fire Protection Association, International National Capital Region Chapter of Society of Fire Prevention Engineers Environmental Design Research Association National Task Force on Life Safety for the Handicapped Ottawa Association for Science in Society
Experience:	
1961-1963	B.C. Forest Service, Forest Surveys Division
1965	H.A. Simons Ltd., Vancouver, Site Engineer
1968-1982	National Research Council of Canada, Division of Building Research, Ottawa
1982-present	National Research Council of Canada Division of Electrical Engineering, Medical Engineering Research Section
Publications: (selected)	
1975	Evacuation and other fire safety measures in high-rise buildings
1975	Fire safety and related man-environment studies
1976	Canadian studies of crowd movement in buildings and sports grounds
1977	Movement of people in building evacuations

1977	Management and movement of building occupants in emergencies
1980	Effective-width model for evacuation flow
1980	Research in Human Behavior
1980	Building Design for Egress
1980	Building Evacuation: Research Methods and case studies (with B. K. Jones)
1980	Fire Safety in Highrise Buildings (Unit 15 of text for the course "Fire Related Human Behavior")
Film Production:	
1978	The Stair Event

Numerous Conferences, Seminars and Workshops given.

Name:	**Roy Philippe**
Present Position:	Chief, Consulting Services Office of the Fire Marshal (Ontario)
Education:	University of Ottawa (1961) Degree: Bachelor of Applied Science (Chemical Engineering)
Memberships: (past & present)	Association of Professional Engineers of Ontario Part 3 — Standing Committee on Use and Occupancy, National Building Code of Canada Task Group on High Buildings (Part 3 NBC) Parts 2, 6, 7 — Standing Committee on Fire Safety in Buildings, National Fire Code of Canada CSA Steering Committee on Structural Design Task Groups — ULC S536, ULC S537, ULC S538, ULC S540M Task Force on Qualification Code for Installation of Solid Fuel Equipment
Experience:	Office of the Fire Marshal (Ontario)
1966-1973	Plans Approval Engineer
1973-1975	Special Projects Engineer
1975-1977	Assistant Chief — Engineering
1977-present	Chief, Consulting Services

Name:	**Thomas Gordon Smith**
Present Position:	Director of Elevating Devices Branch of the Technical Standards Division, Ministry of Consumer and Commercial Relations (Ontario)
Education:	Heriot-Watt University, Edinburgh, Scotland (1953) Degree: Engineering McGill University (1958) Degree: Business Administration
Experience:	
1958-1974	Ontario Manager — Brocklesby Transport Ltd. Subsidiary of Power Corporation Ltd. (heavy transport, building, rigging, etc.)

1974-present	Director, Elevating Devices Branch Ministry of Consumer and Commerical Relations (Ontario) (inspection and licensing of new and existing elevators, escalators, etc.)
Name:	**George Toshiaki Tamura**
Education:	University of Manitoba (1951) Degree: Bachelor of Science (Mechanical Engineering)
Memberships:	Professional Engineers of Ontario American Society of Heating, Refrigerating and Air Conditioning Engineer (ASHRAE)
Committee Activities:	ASHRAE T.C.5.6. Fire and Smoke Control (1974-81) NFPA Air Conditioning Committee (1972-1977) (National Fire Protection Association)
Research:	1. Air infiltration in Buildings *2. Smoke Movement and Control in High-Rise Buildings 3. Ventilation and Indoor Air Quality * author or co-author of about 30 publications in this area
Experience:	
1951-1959	Orenda Engine Ltd. Design Analysis Engineer
1959-present	National Research Council Senior Research Officer
Publications: (selected)	Author or co-author of over 30 research papers on smoke movement and control in highrise buildings, including:
1967	Pressure Differences caused by Chimney Effect in Three High Buildings (with A. G. Wilson)
1969	Computer Analysis of Smoke Movement in Tall Buildings
1970	Factors in Controlling Smoke in High Rise Buildings (with J. H. McGuire)
1971	Smoke Control in High Rise Buildings (with J. H. McGuire)
1971	Smoke Movement in High Rise Buildings (with J. H. McGuire)
1973	The Pressurized Building Method of Controlling Smoke in High Rise Buildings (with J. H. McGuire)
1975	Simple Analysis of Smoke Flow Problems in High Buildings (with J. H. McGuire)
1979	The National Building Code Smoke Control Measures — An Overview (with J. H. McGuire)
1982	DBR/NRC Studies on Control of Smoke in Highrise Fires

Name:	**Edmund Moores Tuff**
Present position:	Engineering Manager, Otis Elevator Company Ltd.
Education:	Technical University of Nova Scotia (1945) Degree: Electrical Engineering
Memberships:	Association of Pofessional Engineers of Ontario C.S.A. B44 Committee, Elevator Safety Code (Chairman) ULC Committee on Fire Tests ANSI/ASME A17.1 Elevator Safety Code — Liaison
Experience:	
1946-present	Otis Elevator Company — Works Engineer — Field Adjuster — Field Engineer — Supervision of Field Education — Construction Manager

Name:	**Dr. Richard Viau**
Present Position:	Chief of the Flammability Hazards Division, Product Safety Branch, Department of Consumer and Corporate Affairs (Canada)
Education:	University of Ottawa (1969) Degree: Bachelor of Science (Chemistry) (Honours) University of Ottawa (1973) Degree: Ph.D. (Chemistry)
Memberships:	Underwriters' Laboratory of Canada; (Fire Testing Committee) Warnock-Hersey Fire Council Canadian General Standards Board American Society for Testing & Materials
Experience:	
1973	Research Associate, University of Sherbrooke
1974	Public Services Commission, Science & Technology Program
1975	Department of Consumer & Corporate Affairs (Canada) Senior Chemist, Product Safety Laboratory
1978	Department of Consumer & Corporate Affairs (Canada) Head of the Chemical Fire Safety Program
1980-present	Product Safety Branch, Chief of the Flammability Hazards Division

Name:	**William Wretham**
Present Position:	Fire Chief for the Borough of Scarborough
Memberships:	Ontario Association of Fire Chiefs (President) Canadian Association of Fire Chiefs

Metropolitan Toronto Fire Chiefs Committee
International Association of Fire Chiefs
The Institute of Fire Engineers
Canadian Fire Safety Association

Experience:

1950-1954	Firefighter
1954-1957	Captain/Firefighter
1957-1968	District Chief in Charge of Training
1968-1976	Deputy Chief
1976-present	Fire Chief for the Borough of Scarborough

Appendix A.5A

WITNESSES CALLED BY THOSE WITH STANDING

Mr. John Bassel
Mr. Fred Bever
Mr. Donald J. Boehmer
Mr. Bernard Bonser
Ms. Junie Boudreau
Mr. Ronald Bowman
Mr. Russell W. Cooper
Mr. Christopher Fillingham
Mr. Geogre Fleming
Mr. John W. Fothergill
Mr. Rick Gerundin
Mr. William Goff
Mr. Charles C. Greenberg
Mr. Jack H. Gringorten
Mr. Christopher C. Hart
Mr. John Haunts
Mr. Alan James Hill
Mr. Douglas Howes
Mr. William Kennaley
Mr. Paul Hirst Kevill
Mr. Alvin McBride
Mr. John McFadden
Mr. Dale Martin
Mr. Walter W. G. Miller
Mr. David Charles Moulds
Mr. Robert T. Myles
Mr. Rashmi Nathwani
Mr. Michael Nixon
Mr. Rudy Palladina
Mr. Norman Pearce
Mr. Marvin Sadowski
Mr. Harry Shaw
Mr. William Sproule
Mr. George B. Tatham
Mr. Haim Zah

Appendix A.5B

QUALIFICATIONS OF WITNESSES CALLED BY THOSE WITH STANDING

Name: **John Bassel**

Membership: Metropolitan Toronto Apartment Builders Association (President)

Experience:
1958-1966 Comptroller of an organization which dealt and managed and sold apartment buildings
1966-present Arcadia Group Investments Ltd. (building and selling rental apartments and condominiums)

Name: **Fred Bever**

Present Position: Community Legal Worker,
Parkdale Community Legal Services Inc.

Education:
Carleton University (1973)
Honours History Program
York University (1976)
Degree: Bachelor of Arts (Honours)
University of Toronto (1977)
Degree: Bachelor of Education
York University (1978)
Certificate: Special Education
University of Toronto (1980)
Canadian Business Law

Memberships: (past & present)
Queen-Dowling Tenants' Association
Parkdale Tenants' Association

Experience:
1977-1978 Teacher, Browndale (Ontario) Red Wheel School
1978-1980 Community Legal Worker, Metro Tenants Legal Services
1981-present Community Legal Worker, Parkdale Community Legal Services

Name: **Donald J. Boehmer**

Present Position: Vice-President and Manager,
Rolf Jensen & Associates, Ltd.

Education: Illinois Institute of Technology (1963)
Degree: Bachelor of Science in Fire Protection Safety Engineering

Memberships: (past & present)
Association of Professional Engineers of Ontario (designated as a Fire Protection Specialist)
Subcommittee on Use and Occupancy of the Associate Comittee of the National Building Code
Task Group on Rehabilitation of Buildings
Ontario Fire Code, Part 9
National Fire Protection Association
National Society of Fire Protection Engineers

Experience:
1963-1970 Engineer with Illinois Inspection and Rating Bureau
1964-1967 U. S. Navy
1970-1974 Consulting Engineer in Fire Protection Engineering (Rolf Jensen & Associates, Inc.)
1974-present Vice-President and Manager, Rolf Jensen & Associates, Ltd.

Mr. Boehmer served as a Project Manager and Project Engineer on the following research oriented projects (selected):

- Study involving Fire Protection Aspects of the Rehabilitation of Existing Buildings for the National Research Council of Canada
- Subcommittee on Study of the Additional Requirements for Life Safety in Highrise Commercial Buildings for the Building Code Branch of the Ministry of Consumer and Commercial Relations of Ontario

Name: **Bernard Bonser**

Present Position: Fire Chief of City of Toronto

Memberships: (past & present)
Canadian Association of Fire Chiefs (President)
Metropolitan Toronto Region Emergency Fire Co-ordinator
Committee on the National Fire Code 1971-1974
Committee on the National Building Code 1976-1982
Associate Committee on Fire Research of the National Research Council
Underwriters' Laboratories of Canada Fire Council
Canadian Standards Association
Fire Council
Warnock-Hersey Fire Council

Employment History:
1946-1977 Toronto Fire Department
1977-present Fire Chief City of Toronto

Name:	**Junie Boudreau**
Present Position:	Student, Centennial College
Memberships:	Regent Park Residents Association Lives in a building administered by the Metropolitan Toronto Housing Authority and owned by Ontario Housing Corporation
Name:	**Ronald Bowman**
Present Position:	Executive Vice-President, Ontario Professional Firefighters Association
Education:	University of Montreal (1970) Canada Labour College Course Taken: Labour Studies
Experience:	Hamilton Fire Department
1960-1964	Firefighter
1964-1973	Rescue Unit
1973-present	1st Class Firefighter
Name:	**Russell W. Cooper**
Present Position:	Executive Director, Ontario Hotel & Motel Association
Name:	**Christopher T. Fillingham**
Present Position:	Associate and General Manager Dunlop, Farrow Aitken*
Education:	University of Toronto (1968) Degree: Bachelor of Architecture
Memberships: (past & present)	Ontario Association of Architects Royal Architectural Institute of Canada Canadian Fire Safety Association Standing Committee on Fire Safety in Buildings, for the National Fire Code, Part 2.6.7 Ontario Fire Code Advisory Committee Joint Construction Council of UDI/MTABA (Chairman) Task Group preparing requirements for Fire Fighter Access to Buildings for National Building Code (Chairman) Advisory Committee to the Ministry of Municipal Affairs and Housing (Ontario) on the Renovation Requirements High Rise Task Group of the Use and Occupancy Committee of the National Building Code Ontario Fire Code Task Group on Part 9 — Retrofit (Chairman of the Health Care Facilities Committee of the Task Group) National Fire Protection Association Part 3 Use and Occupancy Standing Committee of the National Building Code

Experience:	
1968-1969	Architect with Harry P. Smith, Kingston
1969-1971	Architect with Yamazaki & Greig, Toronto
1971-1972	Partner of Integrated Management Planning
1972-1981	Architect with Dunlop, Farrow, Aitken
1981-present	Associate and General Manager, Dunlop, Farrow, Aitken

Publications:	
1974-1975	Co-author of reports entitled: — A Study of the Additional Requirements for High Buildings Proposed in Change Series No. 3 to N.B.C. Subsection 3.2.6 — A Study of the Requirements contained in the Second Edition of the National Fire Code of Canada, Part 2, Building and Occupant Fire Safety; Draft for Public Comment — A Report on the Implications of the Requirements for Access for the Handicapped contained in Builders' Bulletin No. 243 issued by C.M.H.C., April 17, 1975
1981-1982	— A Study of the Additional Requirements for New High Commercial Buildings for the Building Code Branch of the Ministry of Consumer and Commercial Relations, Province of Ontario

*On July 1, 1983 Mr. Fillingham became a partner of Dunlop, Farrow, Aitken, Cansfield

Name:	**George Fleming**
Present Position:	Commissioner of Buildings and Chief Building Official, Borough of Scarborough
Education:	University of Toronto (1958) Undergraduate studies in Architecture (2 yrs.) Degree: Bachelor of Science (Honours) (Civil Engineer) Centennial College Certificate: Public Administration
Memberships: (past & present; selected)	Association of Professional Engineers of the Province of Ontario Canadian Fire Safety Association (Second Vice President on Founding Board of Directors) National Fire Protection Association Building Officials and Code Administrators International Inc. International Conference of Building Officials Southern Building Code Congress International Inc. National Academy of Code Administration Canadian Building Officials Association (President 1974-1975 and 1975-1976) Ontario Building Officials Association (President 1978-1979)

Fire Council, Underwriters' Laboratories of Canada
Committee on Uniform Building Standards for Ontario (1978-1979)
Ad-Hoc Committee on Part 1, Administration, Associate Committee on the National Building Code of Canada (1970-1974)
Task Group, Safety in High Rise Buildings Associate Committee on the National Building Code of Canada (1968-1974)
Standing Committee on Use and Occupancy, Associate Committee on the National Building Code of Canada (1970-1974)
Canadian Building Officials Advisory Council of the Canadian Standards Association (Chairman 1972-1976)
OBOA Master Education Course/Building Official Certification Development Board (Chairman & Manager/Co-ordinator (1979 to present)
Member of Municipal Inspectors Training & Education Council

Experience:
1958-1964 Buildings Engineer, City of Toronto
1964-present Commissioner of Buildings and Chief Building Official, Borough of Scarborough

Publications: Author of 'Ontario Building Officials Association Model Sign Code'
Author of 'Canadian Building Codes — Their Administration and Enforcement — How Well is the Public Served?'

Name: **John W. Fothergill, Jr.**

Present Position: Integrated Systems Incorporated,
Brunswick, Maryland,
Principal

Education: California State University (1952)
Degree: Bachelor of Mathematics
California State University (1956-1959)
Courses taken in: Master of Science Program
Utah State University (1959-1964)
Courses taken in: Graduate Program in Engineering (Fluid Mechanics)
State University of New York (1964-1965)
Courses taken in: Graduate Program in Mathematics

Memberships: Smoke Control Association
National Fire Protection Association
Naval Institute
ASHRAE Technical Committee 5.6 on Fire and Smoke Control

Experience: (selected) Designed smoke control and fire protection systems for a Ship Environmental Simulation Facility

Principal investigator on a contract to the Centre for Fire Research at the National Bureau of Standards for Developing Design Technology for Smoke Control and Removal Systems
Designer of smoke control systems for a number of large commercial buildings
Principal Investigator on a Study to the National Bureau of Standards for Fire Research to Improve Predictive Techniques for Estimating Smoke Movement and Toxic Gas Concentrations in High-rise Buildings and Connected Building Complexes
Principal Investigator on project to develop first design manual to design smoke control systems for large buildings
Project Engineer on a number of fire simulation/testing and evaluation projects

Publications:
1978 Computer Aided Design Technology for Smoke Control & Removal System
1978 Smoke Control Systems Design Tools
1979 Smoke Movement Studies at the NIH Clinical Center
1980 The Atrium as a Fresh Air Channel — A Different Concept in Smoke Control
1980 Testing of the IDS Tower Smoke Control System

Name: **Rick Gerundin**
Present Position: Acting Corporal
Field Co-ordination Branch
Helicopter Section
Ontario Provincial Police

Experience:
1973-1974 Commercial helicopter pilot
Skyrotors,
Arnprior, Ontario
1975-1979 Constable
Ontario Provincial Police
(General Police Work)
1979-present Ontario Provincial Police
(Helicopter Section)

Name: **William Goff**
Present Position: President, P.T.E. Industries
Education: Engineering (Mechanical)

Name:. **Charles Greenberg**
Present Position: Director of Practice,
Ontario Association of Architects (O.A.A.)
Education: University of Pennsylvania (1958)
Degree: Bachelor of Architecture

Membership: Ontario Association of Architects

Experience:
1961-1981 Private practice of Architecture
1981-present Director of Practice,
Ontario Association of Architects

Name: **Jack H. Gringorten**

Present Position: Senior Vice-President, Property
Administration, Olympia & York

Education: University of Toronto
Degree: Bachelor of Arts
Columbia University
Degree: Master of Arts

Memberships: (past & present) Canadian Institute of Management (Life Member)
Canadian Industrial Management Association
Associate Committee of the National Fire Code
Past Chairman of the Education Committee
of Toronto Building Owners & Managers
Association (BOMA)

Experience: Personnel Manager, General Manager and
Owner of a manufacturing firm
1965-present Property Administrator, Olympia & York
Senior Vice-President, Olympia & York since 1980
Involved in development of a four-year
Educational Program leading to the Degree
of Certified Industrial Manager (C.I.M.)
Lecturer at George Brown College (Toronto);
and prepared its course outline for
Property Management

Publication: (to be released) Working Manual for Property Managers

Name: **Christopher Carleton Hart**

Present Position: Director of Legal Services,
Association of Professional Engineers of Ontario

Membership: Association of Professional Engineers of Ontario

Name: **John Haunts**

Present Position: Senior Assistant Manager
Royal York Hotel
Toronto, Ontario

Membership: Ontario Hotel & Motel Association,
Fire Safety Committee

Name:	**Alan James Hill**
Present Position:	Fire Protection Consultant, Marsh & McLennan Ltd.
Education:	Sir George Williams University, Montreal (1963) Degree: Bachelor of Science Industrial Accident Prevention Association (1973) Course Taken: Accident Prevention Fundamental American Society of Heating, Refrigeration and Air Conditioning Engineers Inc. (1976) Course Taken: New Techniques for Fire & Life Safety in Buildings International Loss Control Institute (1978) Course Taken: Professional Consulting in System and Loss Control Management University of Maryland (1981) Course Taken: Systems Application for Fire Protection Engineers University of Maryland (1982) Course Taken: Industrial Fire Risk Analysis
Memberships:	Society of Fire Protection Engineers — Full Member (1976) — President, Southern Ontario Chapter (1980-82) Montreal West — Volunteer Fire Department
Experience:	
1965-1969	Marsh & McLennan Ltd. (Montreal)
1969-present	Marsh & McLennan Ltd. (Toronto) — Consultant for Molson Companies Ltd. Simpson Sears Atlantic Packaging Canada Packers Ontario Hydro
Papers/ Presentations:	
1969	The Specification Writers Association of Canada, Montreal, "Togetherness — The Design Team Concept"
1973	ORIMS (Ontario Risk & Insurance Management Society) Toronto, "Computer Insurance & Loss Prevention"
1975	The Mariners Club, Toronto, "Total Loss Control for Buildings Under Construction"
1979	The Engineering Institute of Canada — Calgary Branch "New Sprinklers & High Rise Safety"
1981	Canadian Association of Risk Managers Society, Conference, Toronto "High Rise Fire Safety"

Name:	**Douglas Howes**
Present Position:	Councillor, Mono Township Council
Experience:	
1951-1957	Automatic Sprinkler Company of Canada (now Wormald International)
1957-1965	Ontario District Manager of Wormald

1965-1979	Bennett and Wright
1968-1976	District Manager of Bennett and Wright
1976-retirement	Vice-President of Bennett and Wright

Name:	**William Kennaley**
Present Position:	Director, Information Canadian Automatic Sprinkler Association
Education:	Ryerson Polytechnical Institute (1964) Certificate: Engineering Technology Wilfrid Laurier University (1972) Degree: Bachelor of Arts
Memberships:	Ontario Association of Certified Engineering Technicans and Technologists Canadian Institute of Planners
Experience:	
1964-1969	Proctor & Redfern Ltd. Consulting Engineers
1969-1972	W.L.U.
1972-1975	Assistant to the Vice-President — Land Development Consolidated Building Corporation
1975-1977	Director of Planning, HUDAC
1977-1980	Senior Planner, Freure Homes Ltd.
1980-present	Director Information, Canadian Automatic Sprinkler Association

Name:	**Paul Hirst Kevill**
Present Position:	Protection Mutual Insurance Company, Senior District Underwriter
Education:	University of British Columbia Degree: Bachelor of Applied Science (Electrical Engineering)
Memberships:	Society of Fire Protection Engineers — President, Southern Ontario Chapter (present) — President, Montreal — Ottawa Chapter (1971-1973) Association of Professional Engineers of Ontario Insurance Institute of Canada (Associate Member)
Experience:	
1956-1973	Factory Mutual Engineering Field Engineer (1956-1966) Montreal District Manager (1966-1975) Toronto Engineering Manager (1975-1978)
1978-present	Protection Mutual Insurance Company Highly Protected Risk Underwriter

Name:	**Alvin D. McBride**
Present Position:	Business Manager of U.A. Local 853, Sprinkler Fitters of Ontario
Membership:	Provincial Advisory Committee re: Qualifications for Sprinkler Fitters

Experience:	
1960-1971	Sprinkler fitter, Adam Clark Company
1971-1983	Business Manager of U.A. Local 853, Sprinkler Fitters of Ontario

Name:	**Jack McFadden**
Present Position:	Chief Fire Prevention Officer City of Toronto Fire Department
Education:	Graduate of Toronto Fire Academy Course for Fire Prevention Inspectors (1977) Graduate of Canadian Fire Safety Association Organization in Fire Technology (1978) Graduate of the Insurers' Advisory Organization of Canada; School of Loss Control and Technology (1979) Course Taken: Sprinkler Systems & Water Supplies
Employment History:	
1956	Firefighter Toronto Fire Department
1970	Fire Prevention Division, Toronto Fire Department
1981	Captain Fire Prevention Division
1981	Chief Fire Prevention Officer City of Toronto Fire Department

Name:	**Dale Martin**
Present Position:	Chairperson, Federation of Metropolitan Toronto Tenants' Associations
Experience:	Consultant, economic consultant and social policy analyst. Research director of Ontario Federation of Students and Opportunities for Youth, Department of the Secretary of State (Canada),

Name:	**Walter W. G. Miller**
Present Position:	Vice-President, Wormald Fire Systems
Education:	McGill University, Montreal (1960) Degree: Bachelor of Engineering Western University, London, Ontario (1970) Diploma: Business Administration Harvard University, Cambridge, Mass. (1981) Diploma: Management Harvard University, Chicago Course taken: CAD/CAM U. of Maryland, Washington, D.C. Course taken: System Methodlogics

Memberships: Society of Fire Protection Engineers
National Fire Protection Association
Canadian Industrial Computing Association
Canadian Automatic Sprinkler Association

Experience:
1962-1963 Automatic Sprinkler Corporation of America, Research and Development
1964-1965 Automatic Sprinkler Limited, Contract Manager
1966-1970 Automatic Sprinkler Limited, District Manager
1971-1979 Automatic Sprinkler Limited, Vice-President
1979-1981 Automatic Sprinklers Limited/Wormald Fire Systems Inc., Vice-President
1981-1982 Wormald Americas Inc., Vice-President
1982-present Wormald Fire Systems, Vice-President

Publications:
1981 Recommendation for Use of Computer Graphics Technology in the Design Engineering and Estimating functions
1981 Computer Systems Recommendations for the support of Engineering Processing Requirements in Wormald Americas

Name: **David Charles Moulds**

Present Position: Marketing Manager,
Occupational Health Products Group
Safety Supply Canada

Name: **Robert T. Myles**

Present Position: Senior Vice-President,
Hanscomb Consultants Inc., Canada

Education: Dundee College of Higher Technology,
Dundee, Scotland — Graduate
Degree: Higher National Certificate (Building Technology)
London City and Guilds
Degree: Quantity Surveying

Memberships: Canadian Institute of Quantity Surveyors (Member)
Ontario Institute of Quantity Surveyors (Member)
Royal Institution of Chartered Surveyors (Fellow)
Chartered Institute of Building (Fellow)
American Institute of Constructors (Professional Constructor)

Experience: Senior position with Chartered Quantity Surveyors, Scotland
Senior estimator for major Canadian general contractor
1972-1979 Hanscomb Consultants Inc., Canada Senior Consultant
Part-time lecturer in building economics, Ryerson Polytechnical Institute (Passed appointment)

1979-Present	Principal — Hanscomb Consultants Inc.
Publications:	Manual for Cost Planning and Cost Control of Building Projects

Name:	**Rashmi N. Nathwani**
Present Position:	Director of Plan Examination, City of Toronto
Education:	Shivaji University, Sangli, India (1964) Degree: Bachelor of Engineering (Civil) University of Waterloo (1969) Degree: Master of Applied Science McMaster University (1979) Degree: Master of Business Administration
Memberships: (past & present)	Association of Professional Engineers (Ontario) Municipal Engineers Association Ontario Building Officials Association Incorporated Canadian Building Officials Association Building Officials Conference of America Engineering Institute of Canada Canadian Society of Civil Engineering Ontario Plumbing Inspectors Association Society of Fire Protection Engineers Member of CSA and ULC Code Committees
Experience:	
1964-1967	Construction Engineer, Bombay, India
1967	Junior Engineer, Richmond Hill, Ontario
1967-1968	Civil Engineer, Hamilton, Ontario
1970-1972	Technical Services Engineer, Hamilton, Ontario
1972-1979	Deputy Building Commissioner, Hamilton, Ontario
1979-present	Director of Plan Examination, Toronto, Ontario

Name:	**Michael Nixon**
Present Position:	Commissioner of Building & Inspections for City of Toronto
Education:	Queen's University, Belfast, Ireland (1964) Degree: Bachelor of Science (Mechanical Engineering)
Memberships: (past & present)	Canadian Association of Municipal Administrators Canadian Building Officials Association Ontario Building Official Association of the Fire Council Underwriters' Laboratories of Canada Fire Council National Fire Protection Association Board of Trade of Metropolitan Toronto The Canadian Club American Society of Testing Materials Building Officials and Administrator International Canadian Fire Safety Association

Employment History:
1964-1970 Consulting Engineer
Dilworth Seager Meagre & Associates, City of Toronto
1970-1973 Project Engineer
Underwriters Laboratories of Canada
1973-1974 Chief Plan Examiner of the Building Department, City of Hamilton
1974-1978 Director of Plan Examination & Deputy Chief Building Official of the City of Toronto

Name: **Rudy Palladina**

Present Position: Regional Marketing Manager,
Bell Helicopter Textron

Name: **Norman Pearce**

Present Position: Vice-President and Chief Engineer of the Underwriters' Laboratories of Canada

Education: Southhampton University-College — England (1952)
Degree: Mechanical Engineering

Memberships: (past & present)
Institution of Mechanical Engineers
Society of Fire Protection Engineers
Association of Professional Engineers of Ontario
Standing Committee on Fire Performance Rating of the Associate Committee of the N.B.C.C.
Associate Committee on Research for the Fire Services

International Memberships: (past & present)
A.S.T.M. committee E-5 on Fire Tests of
Materials and Construction (past Chairman)
Canadian Advisory Committee on I.S.O. (Chairman)
Technical Committee 92 on Fire Tests on Building Materials and Structures

Experience: Vickers Armstrong Super Marine, England
Avro Aircraft Limited Canada,
Structural & Mechanical Test Department
1960-present Underwriters' Laboratories of Canada
Vice-President & Chief Engineer

Name: **Marvin Sakowski**

Present Position: Senior Vice-President
Maysfield Property Management Inc.

Membership: Chairman of the Management Committee of the Apartment Group of the Urban Development Institute

Experience: Senior Property Manager of the Management Division of Cadillac-Fairview

Name:	**Harry Shaw**
Present Position:	Fire Protection Consultant Harry Shaw and Associates, Inc. Rockville, Maryland
Experience:	
1946-1954	National Bureau of Standards, Diamond Ordinance Fuel Laboratories
1954-1964	Program Management, Emerson Radio & Phon. Corp.
1964-1970	Vice-President, Operations, L.T.V. Inc.
1970-1973	President, Marson Electronic Corp.
1973-1975	Consultant to Office of Secretary of Defence
1975-1982	Assistant Administrator, U.S. Fire Administration
1982-present	Fire Protection Consultant

Name:	**William Sproule**
Present Position:	Assistant Deputy Fire Chief, City of Toronto
Education:	Graduate of Ontario Fire College Degree in Fire Technology from Seneca College
Memberships: (past and present)	Advisory Committee on The Ontario Fire Code, and Part 8 subcommittee on The Ontario Fire Code (chairman) U.L.C. Committee on Fire Alarm Systems Canadian Fire Safety Association (Director) Society of Fire Protection Engineers (Director)
Experience:	Director of Fire Prevention, City of Toronto

Name:	**George V. Tatham**
Present Position:	Senior Vice-President, Canadian Division, Oxford Development Group Ltd.
Education:	University of British Columbia, Specialized course in electronics
Memberships: (past & present)	B.O.M.A. American Standard Method of Measurement Committee Special Task Force on Smoke Control in High Rise Buildings Use & Occupancy Committee of the National Building Code Special Task Force on Dead End Corridors B.O.M.A. Nomination Committee B.O.M.I. Board Member
Experience:	
1943-1954	Taught radar to Canadian Bomber Group in England
1954-1968	Yolles & Rotenberg Ltd.
1968-1976	Vice-President Commercial Division, Y & R Properties Ltd.
1976-1978	President, Y & R Properties Ltd.
1978-present	Senior Vice-President, Canadian Division, Oxford Development Group Ltd.

Name:	**Haim Zah**
Present Position:	Vice-President, P.T.E. Industries

Appendix A.6A

PERSONS MAKING ORAL PRESENTATIONS

Mr. Donal M. Baird
Mr. Ronald Douglas Brown
Mr. George A. Coleman
Mr. Christopher Cornish
Mr. Patrick J. DeFazio
Ms. Karen Eluck
Mr. J. A. Euclid Herie
Mr. Earl Hunter
Mr. Gerhard J. Landmesser
Mr. Lyle L. MacLennan
Mr. Paul Meleta
Mr. Edward Munro
Mr. Mark Patamia
Mr. Larry D. Simonato
Mr. Gerhard W. Stephan
Mrs. Elsie Stiles
Mrs. Joyce Thompson
Mr. Mark Waxer
Mr. Ronald W. Wheeler

Appendix A.6B

QUALIFICATIONS OF PERSONS MAKING ORAL PRESENTATIONS

Name:	**Donal M. Baird**
Present Position:	Director, Fire Underwriters Survey, Insurance Bureau of Canada
Education:	University of New Brunswick Degree: Bachelor of Science
Experience:	
5 years	Volunteer firefighter, City of Fredericton, New Brunswick
16 years	Technical associations of the fire and casualty insurance field in fire protection, inspection and engineering
2 years	National Research Council, Study on Fire Prevention and Control Systems in Canada
19 years	Director, Fire Underwriters Survey, Insurance Bureau of Canada
22 years	Building and Fire Prevention Code Writing Committees of NRC
Memberships: (past & current)	Society of Fire Prevention Engineers (Charter Member) Canadian Association of Fire Chiefs International Association of Fire Chiefs National Fire Protection Association Canadian Fire Safety Association Canadian Building Officials Association
Publication:	
1980	Study on Fire Prevention and Control Systems in Canada (with R.W.A. Switzer)

Name:	**Ronald Douglas Brown** Handicapped highrise resident
Experience:	Lived in various highrise buildings for approximately ten (10) years.

Name:	**George A. Coleman**
Present Position:	General Manager, Metropolitan Toronto Housing Company Limited, Homes for the Aged Division
Experience:	
7 years	General Manager, Metropolitan Homes for the Aged

Name: **Christopher Cornish**
Present Position: Project Manager, Real Estate Development
Education: Dalhousie University, Halifax (1969)
Degree: Bachelor of Arts (Economics)

Experience:
1969-1972 Development Department of T. Eaton Company
1972-1975 Project Manager for Oxford Development Group Limited
1975-1976 Director, Special Projects Division of Y & R Properties Limited, Toronto
1976-1981 President of Roxborough Development Corporation
1981-present Vice-President of Dover Park Development Corporation Limited

Name: **Patrick J. DeFazio**
Present Position: Captain, Ottawa Fire Department
Membership:
1973-1982 Ontario Professional Firefighters Association (President)

Experience:
1957-present Firefighter, Ottawa Fire Department

Name: **Karen Eluck**
Present Position: Vice-President,
Third Degree Prevention Ltd.
markets the Water Jel Fire Blanket

Name: **J. A. Euclid Herie**
Present Position: Executive Director,
Canadian National Institute for the Blind

Name: **Earl Hunter**
Present Position: Superintendent,
Manufacturers Life Building (Toronto)
Membership: President, Toronto Building Superintendents Association
Experience: Instructor
Building Environmental Systems Course
(Seneca College, Toronto)

Name: **Gerhard J. Landmesser**
Present Position: Regional Manager,
Pyrotronics Canada Limited
Memberships: (past & present)
Canadian Fire Safety Association (Past President)
Canadian Fire Alarm Association
Ontario Building Officials Association
National Fire Protection Association

	Ontario Fire Chiefs Association
	Society of Fire Protection Engineers (Board of Directors)
Experience:	
1966-1972	Pyrene Fire Equipment Company
1972-present	Pyrotronics Canada Limited

Name:	**Lyle L. MacLennan**
Present Position	Chief, Ottawa Fire Department
Memberships:	Ontario Association of Fire Chiefs
	Canadian Association of Fire Chiefs
	International Association of Firefighters
Experience:	
1952-1965	Firefighter
1965-1969	Lieutenant
1969-1973	Captain
1973-1978	District Chief
1978-1980	Platoon Chief
1980-1982	Executive Officer
1982-present	Chief, Ottawa Fire Department

Name:	**Paul Meleta**
Present Position:	Quality Control Inspector Borough of Scarborough
Experience:	V. K. Mason Construction
	Bregman and Hammann Architects
1968-present	Borough of Scarborough

Name:	**Edward Munro, B. Arch., M.R.A.I.C., M.O.A.A.**
Present Position:	Regional Architect, Canadian Portland Cement Association

Name:	**Mark Patamia**
Present Position:	Executive Director, Ontario Concrete Block Association, and National Concrete Producers Association
Education:	Glasgow University, Scotland (1953) Degree: Master of Arts (French & Italian)
	Glasgow University, Scotland (1956) Degree: Bachelor of Laws
	The Canadian Credit Institute (1966) Degree: M.C.I. (Hon.)
Memberships: (selected)	Canadian Standards Association: Technical Committee A165: Concrete Housing Units (Chairman)
	CSA Steering Committee — Member
	Technical Task Group; Residential Renovation Guidelines, Ministry of Housing — Member

Name: **Larry Simonato**
Present Position: Director of Enforcement Services,
Corporation of the City of Cambridge
Education: Ryerson Polytechnical Institute (1969)
Architectural Association of Technologists
Diploma: Certified Engineering Technologist
Experience:
1974-1976 Corporation of the City of Cambridge,
Plans Examination
1976-present Corporation of the City of Cambridge,
Director of Enforcement Services

Name: **Gerry Stephan**
Present Position: President,
Help Smoke Protection Mask Inc.

Name: **Elsie Stiles**
Highrise resident
Membership: President, Board of the Condominium Corporation
Experience:
14 months Manager of highrise condominium
9 months Secretary to Manager of highrise commercial property
Prepared a fire safety guide for use in a highrise building in which she resides.

Name: **Joyce Thompson**
Present Position: Orientation and mobility instructor, and
Case Manager in Deaf/Blind Services
Canadian National Institute for the Blind

Name: **Mark Waxer**
Present Position: Vice-President,
Third Degree Prevention Ltd.

Name: **Ronald W. Wheeler**
Present Position: Involved in promoting fire safety
highrise buildings
Experience:
15 years Suffolk Fire Brigade
West Sussex Fire Brigade
— officer

Appendix A.7

LIST OF EXHIBITS

Exhibit Number	**Description of Exhibit**
1.	Order in Council (Dated June 30, 1982) Pursuant to the provisions of the *Public Inquiries Act,* R.S.O. 1980, chapter 411, appointing His Honour John B. Webber, Judge of the County Court of the County of Dufferin, a Commissioner to inquire into the subject of fire safety in highrise buildings in Ontario.
2.	Notice of Public Hearings.
3.	Organizational chart of the Office of the Fire Marshal of Ontario.
4.	Distribution of buildings, Ontario, seven stories and greater.
4A.	Worksheet showing calculations in support of Exhibit 4, entitled "Total Number of High Rise Buildings in the Province of Ontario."
5.	Summary of fire statistics, Ontario, apartments and residential, all heights (1976-1981).
6.	Summary of fire statistics, Ontario, pertaining to hotels.
7.	Summary of fire statistics, Ontario, for apartments seven stories and greater (1976-1981).
8.	Summary of fire statistics, Ontario, for hotels seven stories and greater (1976-1981).
9.	Summary of fire statistics, Ontario, for business and mercantile buildings thirteen stories and greater (1976-1981).
10.	Summary of fire death statistics, Ontario, for hotels and residential buildings greater than seven stories (1976-1981).
11.	Summary of fire statistics, Ontario, dealing with percentage of total incidents where smoking material was the source of ignition for apartments and hotels seven stories and greater.
12.	Summary of fire statistics, Ontario, for apartments five stories and greater, and apartments and dwellings four stories and under.
13.	Fire death and injury rates, 1981, for Ontario.
14.	Chart of residential buildings fire death and injury rate average for 1976 to 1981, for Ontario.

Exhibit Number	Description of Exhibit
15.	Summary of the deaths and injuries in rooming, boarding, lodging houses in Ontario for 1976 to 1981.
16.	Published report of Fire Marshal's Office re fire losses in Ontario for 1976.
17.	Published report of Fire Marshal's Office re fire losses in Ontario for 1977.
18.	Published report of Fire Marshal's Office re fire losses in Ontario for 1978.
19.	Published report of Fire Marshal's Office re fire losses in Ontario for 1979 and 1980, combined.
20.	Fire Marshal's Office printout re fire losses in Ontario for 1981, unpublished.
20A.	Published report of Fire Marshal's Office re fire losses in Ontario for 1981.
21.	Table 3.1.2.A of the Ontario Building Code.
22.	Part of Report of Governor of Nevada on fire safety codes.
23.	Curriculum vitae of Roy Philippe.
24.	Governor of Nevada's Commission on Fire Safety Codes, final report.
25.	1979 Draft Ontario Fire Code, subsection 1.1.4, dealing with licensing of tradesmen, as circulated for public comment.
26.	1979 draft Ontario Fire Code, part 9 (Retrofit), as circulated for public comment.
27.	Copy of letter dated November, 1981 from R. Roy McMurtry, then Solicitor-General, which accompanied the Fire Code.
28.	National Fire Code of Canada, 1980, office consolidation.
29.	Canadian Standards Association standard number C282-1977 concerning emergency electrical power supply for buildings.
30.	*Municipal Act*, R.S.O. 1980, c. 302, section 210, paragraphs 34–43.
31.	Occupied private dwellings in Ontario, being document E564 of the 1981 Census of Canada.
32.	Photostat of the National Building Code 1980, Appendix A (Explanatory Material) re: Subsection 3.2.6: High Buildings.
33.	The Ontario Fire College, 1982, course calendar.
34.	Article entitled "A Systematic Approach to Fire Safety in Rehabilitation of Buildings" by J. K. Richardson. (see Bibliography)

Exhibit Number	Description of Exhibit
35.	Results of fire prevention by-law questionnaire dated August 22, 1979 distributed by Office of the Fire Marshal; (questionnaire dated December 28, 1978, attached).
36.	Two-page document entitled, "Fire Casualties Report Form" (pre-1981), Office of the Fire Marshal.
37.	Revised Casualty report instituted in 1981, Office of the Fire Marshal.
38.	Pamphlet re: program on fire safety offered by Seneca College in conjunction with the Canadian Fire Safety Association.
39A.	Typical bedroom-floor plan of the Inn on the Park.
39B.	Floor plan of Tower Room, Inn on the Park.
39C.	Floor plan for 2nd floor before addition of the Tower, Inn on the Park.
39D.	Floor plan for 1st floor of the Tower, Inn on the Park.
39E.	North elevation of Inn on the Park Tower.
39F.	Plot plan of Inn on the Park.
40.	Copy of verdict of Coroner's Jury dated May 7, 1981 re fire at the Inn on the Park. Inquest into the death of six persons.
41.	Report of the fire at the Inn on the Park by Ontario Fire Marshal's Office prior to the inquest, containing a synopsis of the fire and evidence given by various members of the investigative team.
42.	Acetate drawing by William Wretham re fire department access concerns.
43.	Acetate drawing by William Wretham of actual access problem for a fire department.
44.	Pamphlet entitled, "If You Live in a Highrise" produced by the Ontario Municipal Fire Prevention Officers' Association; and Ontario Safety League.
45.	Borough of Scarborough Council resolution dated June 21, 1976 re: administration of fire safety matters under the Ontario Building Code.
46.	Prefire plan for the Angebilt Hotel in Orange County, California.
47.	Brochure on Insurance Advisory Organization and Underwriters' Laboratories of Canada, Course 302 re sprinklers and water supplies for industry, October 25-29, 1982.
48.	Scarborough Fire Department Letter addressed to building owners and property managers, occupants and/or other persons controlling property re: Ontario Fire Code.

Exhibit Number	Description of Exhibit
49.	North York fire safety information.
50.	National Building Code of Canada, 1980.
51.	Supplement to the National Building Code of Canada, 1980; and Index to smoke control measures in the National Building Code, prepared by Commission staff.
52.	1979 fire safety sign for hotel bedrooms. (Office of the Fire Marshal)
53.	Fire safety sign for buildings with single-stage alarm systems. (Office of the Fire Marshal)
54.	Fire safety sign for buildings with multi-stage alarm systems. (Office of the Fire Marshal)
55.	Current fire safety sign for government buildings. (Ministry of Government Services)
56.	Proposed amendments to *Hotel Fire Safety Act* and Regulations.
56A.	Letter from Mr. Hess to Mr. Ritchie, Legal Director of the Ministry of the Solicitor General, and attached second draft of amendments to *Hotel Fire Safety Act* and Regulations.
57A.	CAN4-S536-82 (formerly ULC-S536-1979) Standard for the testing, inspection and maintenance of fire alarm systems.
57B.	CAN4-S524-M82 (formerly ULC S524-M1980) Standard for the installation of fire alarm systems.
57C.	CAN4-S537-82 (formerly ULC-S537-1980) Standard for the verification of fire alarm system installations.
58.	Concordance between Ontario Fire Code and proposed *Hotel Fire Safety Act* and regulations.
59.	Acetate sketch by John Hess showing dead-end areas in pre-1971 hotels.
60.	Inn on the Park fire plan # 1.
61.	Inn on the Park fire plan # 2.
62.	Hotel Fire Safety Unit of Office of the Fire Marshal, Emergency planning document dated August 19, 1982.
63.	May 1981 copy of the Fire Journal containing an article by Jon C. Jones entitled "A Brief Look at the Hotel Fire Record." (see bibliography)
64.	Proceedings of the Standing Committee on Administration of Justice of the Ontario Legislature dated June 24, 1981 re: consideration of Bill 59, an *Act to amend the Fire Marshal's Act.*
65.	Ontario Liquor Licence Board document entitled "Guidelines for Evacuation Plan," dated May 4, 1977.

Exhibit Number	Description of Exhibit
66.	Ontario Liquor Licence Board inspection reports of the Inn on the Park, from June 1, 1976 to January 22, 1981.
67.	Inspection report notice of violation form used by the Office of the Fire Marshal in its hotel inspection programme.
68.	Draft pamphlet for hotel guests.
69.	Draft proof of revised Exhibit 55.
70.	Letter from Ontario Liquor Licence Board to Commissioner and Chief Building Official of the City of Toronto dated March 15, 1982 concerning section 19 (1) of regulation 581/80.
71.	National Fire Prevention Association Standard 13, 1980, sprinkler systems installation.
72.	P.T.E. Formula 111 technical data.
73.	Portion of California Fire Code re: Fire Retardants.
74.	Letter from Fire Marshal of California to P.T.E. Industries Inc. dated July 16, 1982.
75.	Covering letter of October 10, 1982 addressed to P.T.E. Industries Inc. with the Israeli Standard Code S.I. 755 and S.I. 921 attached.
76.	National Research Council of Canada publication entitled "Division of Building Research." (see bibliography)
77.	"DBR's fire research station", An article in National Research Council of Canada publication entitled "Building Research News". (see bibliography)
78.	National Research Council of Canada, Division of Building Research, Research Programme 1982/83. (see bibliography)
79.	Associate Committee, National Building Code, Policies and standards, 1981.
80.	Associate Committee, National Fire Code, Policies and standards, 1981.
81.	Photostat of Organization chart of National Research Council of Canada.
82.	Photostat of Organization of the Division of Building Research, National Research Council of Canada, dated March, 1982.
83.	Unpublished note by Dr. N. B. Hutcheon re smoke control research, dated 1981.
84.	Study on Fire Prevention and Control Systems in Canada, by R.W.A. Switzer and D. M. Baird. National Research Council publication dated September, 1980. (see bibliography)
85.	Curriculum vitae of George T. Tamura.

Exhibit Number	Description of Exhibit
86.	An article written by J. H. McGuire and G. T. Tamura entitled, "The National Building Code Smoke Control Measures: an Overview". (see bibliography)
86A.	Envelope of seven photos being reproductions of Mr. Tamura's overhead charts re stack effect.
87.	Smoke concentration chart.
88.	Air Flow Chart.
89.	"Computer Analysis of Smoke Movement in Tall Buildings" by George T. Tamura. (see bibliography)
90.	Partial analysis of 1979 and 1980 fire loss statistics prepared by Chief J. Gibson, Fire Chief, City of North York. (Re: Deaths and Injuries)
91.	Building audit procedure, Office of the Fire Marshal, Hotel Inspection Unit.
92.	Building audit procedure in relation to the Travelodge Motel in North York. (example)
93.	Map of Ontario showing inspection districts for Fire Marshal's Office Hotel Inspection Unit.
94.	Acts which predated the 1971 *Hotel Fire Safety Act,* namely *Hotel Fire Accident Prevention Act,* R.S.O. 1937, c. 320; *Hotel Fire Safety Act* R.S.O. 1960, c. 179; *Hotel Fire Safety Act,* R.S.O. 1970, c. 211; Revised Regulations of Ontario 488/1970; Ontario statute citator re: *Hotel Fire Safety Act.*
95.	Letter from Ian Barbour, General Manager of the Inn on the Park to Mr. John Hess, Fire Protection Services, Office of the Fire Marshal dated October 31, 1980, concerning the testing programme of fire alarm system.
96.	Table showing differences between *Hotel Fire Safety Act* and Regulations, and Ontario Building Code, prepared by Rashmi Nathwani.
97.	Hotel inspection program dated December 16, 1981. Reflects the districts and the staffing for the districts, the number of regulated establishments, the counties which are within each of the geographical districts and the major centres in which the Office has staff located.
98.	Concordance of proposed amendments to *Hotel Fire Safety Act* and Regulations and Ontario Building Code and Ontario Fire Code, prepared by Commission staff.
99.	Section 3.2.6 of the 1970 National Building Code. (additional requirements for high buildings)
100.	Curriculum vitae of Peter Gathercole.
101.	Report of the Ministry of the Solicitor General, Office of the Fire Marshal, Public Safety Division, dated December 8, 1982 pertaining to the fire at 88 Bloor Street East, August, 1982.

Exhibit Number	Description of Exhibit
	Attachment - Letter from Peter Gathercole re: pull stations at 88 Bloor, January 10, 1983.
102.	Verdict of the Coroner's Jury reporting on the cause of death of Basil Campbell, an occupant at 88 Bloor Street East.
103.	Block plan, Yonge and Bloor streets.
104.	Plan of section through 88 Bloor Street East in a north/south direction.
105.	Sketch of 18th floor apartment tower, 88 Bloor Street East, showing apartment layout.
106A.	Photograph of 21st floor corridor looking west, 88 Bloor Street East.
106B.	Photograph of manual station for fire alarm system, 88 Bloor Street East.
106C.	Photograph of entrance to east stair at the 20th floor level, 88 Bloor Street East.
106D.	Photograph of kitchen of apartment 1809, showing smoke staining from exhaust register, 88 Bloor Street East.
106E.	Photograph in apartment 2109 looking south, showing smoke staining and chesterfield, 88 Bloor Street East.
106F.	Photograph of breaker panel in apartment 2109, 88 Bloor Street East.
106G.	Photograph of door to apartment 1815, 88 Bloor Street East.
106H.	Close-up photograph of door to apartment 1815, 88 Bloor Street East.
106I.	Photograph of inside of door to apartment 1815, showing staining, 88 Bloor Street East.
106J.	Photograph of further-away view of inside of door to apartment 1815, 88 Bloor Street East.
106K.	Photograph of charred doorway, 88 Bloor Street East.
106L.	Photograph of apartment 1809 living room, looking south, 88 Bloor Street East.
106M.	Photograph of living room of apartment 1809, showing wall between 1809 and 1810, 88 Bloor Street East.
106N.	Photograph of living room of apartment 1809, looking northeast, 88 Bloor Street East.
106O.	Photograph of west wall of living room of apartment 1809, 88 Bloor Street East.
107.	Canadian Standards Association standard B222.3 manually actuated fire alarm signalling boxes, dated 1972.

Exhibit Number	Description of Exhibit
108.	Report of Peter Gathercole to Chief, Fire Engineering Section of Ministry of Solicitor General re Royal Trust Tower fire, dated January 3, 1974.
109.	Report of Peter Gathercole to Chief, Fire Engineering Section, Ministry of the Solicitor General dated December 9, 1982, re: 800 Richmond Street fire.
110.	Copy of information laid against Mount Brier Building Corporation, Toronto, the owner of 800 Richmond Street.
111.	Copy of report from Peter Gathercole to Mr. Pelletier of the Office of the Fire Marshal dated July 22, 1980 re fire at St. Joseph's Hospital in Hamilton, Ontario.
112.	Four page document consisting of the basement plan of St. Joseph's Hospital, first floor plan, second floor plan, and a section diagram through annex on a north/south axis.
113.	A reproduction of certain portions of Canadian Standards Association Standard B44-1975, being a safety code for elevators, dumbwaiters, escalators and moving walks.
114.	Supplement 3 dated 1982 to CSA B44-1975.
115.	Minutes of the 1982 annual meeting of the Canadian Standards Association B44 Committee on Elevator Safety Code, Newfoundland, September 28, 29, 30, 1982.
116.	Letter and five attachments from the Fire Marshal of Nova Scotia to Canadian Standards Association, dated August 19, 1982 re: CSA B44.
117.	Memorandum re: smoke control requirements under the Ontario Building Code, prepared by Commission staff.
118.	Ministry of Consumer and Commercial Relations, Newsletter no. 10, April, 1980 re: standards to be referred in Building Code.
119.	"Study of Additional Requirements for High Commercial Buildings" by Dunlop, Farrow, Aitken, October 27, 1982, including a revision to original Exhibit 119.
120.	Three-page document entitled, "Instances of Allowed Substitution of Sprinklering for Code Requirements in the Ontario Building Code", prepared by the staff of the Building Code Branch.
121.	List of persons invited by the Building Code Branch to discuss Part Five of the Ontario Building Code, Building Requirements for Handicapped Persons.
122.	Report of Committee on Uniform Building Standards for Ontario, dated November, 1969 (Carruthers Report).

Exhibit Number	Description of Exhibit
123.	Photostatic copy of Hansard of March 4, 1968, dealing with motion number 19 by Mr. Snow, re: adoption of National Building and Fire Codes by the Province.
124.	"Research in Human Behaviour" by J. L. Pauls and B. K. Jones. (see bibliography)
125.	Outline of services and schedule of recommended fees June 30, 1980 of Ontario Association of Architects.
126.	Photostatic copy of Regulation 438/81, being an amendment to the Regulation passed pursuant to the *Theatres Act.*
127.	Two-page outline of committees which were created as a result of the Carruthers Report.
128.	Publication of the Ontario Association of Architects entitled, "Performance Standard for Engineers for Field Services."
129.	The part of volume 2 of the Canadian Handbook of Practice for Architects dealing with the commissioning of buildings.
130.	Draft amendments to Ontario Building Code, as of January 17, 1983.
131.	Organization charts of the Ministry of Consumer and Commercial Relations, and the Building Code Branch.
132.	Letter dated December 31, 1982 from the Executive Director of the Technical Standards Branch of the Ministry of Consumer and Commercial Relations to the Chief Coroner, pertaining to certain recommendations of the Coroner's Jury on the inquest into the death of Basil Campbell.
133.	National Research Council, Associate Committee on the National Building Code proposed changes for 1983 interim revisions to the National Building Code.
134.	Building Standards for the handicapped, 1980, issued by the National Research Council, Associate Committee on the National Building Code.
135.	Curriculum vitae of Christopher Fillingham.
136.	Office consolidation of the *Hazardous Products Act* and Regulations, R. S., c. H-3.
137.	Hazardous Products (mattresses) Regulation PC-1980-2833 effective January 1, 1982.
138.	Photostatic copy of bill marked H. R. 1854, 97th United States Congress, 1st Session dealing with the requirement for persons who manufacture cigarettes to meet certain peformance standards.
139.	Photostatic copy of a bill marked H. R. 877, 97th United States Congress, 1st Session to prohibit the adding of certain substances to a cigarette.

Exhibit Number	Description of Exhibit
140.	Picture of a switch gear.
141.	CSA standard C22.2 #178-1978 — automatic transfer switches.
142.	Revision to CSA standard C282-1977 — Emergency electrical power supply for buildings; amendment no. 3, amending clause 7.1.3 dealing with automatic transfer switches. (see Exhibit 29 for complete standard)
143.	List of standards in the Ontario Building Code looseleaf volume.
144.	Letter from Chief Wretham dated the 10th of January, 1983 concerning the highrise programme results for apartment building education programme conducted in Scarborough.
145.	Letter dated July 9, 1982 from the City of Winnipeg to Mr. Richardson, Codes and Standards Group, National Research Council of Canada, re: highrise buildings certification program conducted in Winnipeg.
146.	Article entitled, "Selective International Comparisons of Fire Loss, 1979-1980" by Jerry Banks. (see bibliography)
147.	Article entitled "Sprinkler Tradeoffs and the Australian Experience" by Harry Marryatt. (see bibliography)
148.	Article entitled, "Sprinkler Tradeoffs — are they Justified", by James P. Barris and Dario Conte-Russian. (see bibliography)
149.	Proforma expense and income calculation, and calculation re: the effect upon rents of cost of sprinklers within that proforma calculation, prepared by Christopher Cornish.
150.	Article entitled, "Risks of Risk Decisions", by Chauncey Starr and Chris Whipple. (see bibliography)
151.	A statement made in the Ontario Legislature on the 27th of January 1983 by The Honourable Norman Sterling, Minister without Portfolio, the Member for Carleton Grenville, re: transfer of Building Code Branch to the Ministry of Municipal Affairs & Housing.
152.	Toronto Star article, December 13, 1980, entitled "If it is fire safety you are after — live in a highrise in Toronto."
153.	Toronto Star article, October 22, 1982, entitled, "Highrise fires: Will the killing ever stop?"
154A.	Part 3 Ontario Building Code general check list for plans review, used by the Borough of Scarborough.
154B.	Fire alarm and detection system check list for plans examination, used by the Borough of Scarborough.
154C.	Check list for sprinkler systems for plans review, used by the Borough of Scarborough.

Exhibit Number	Description of Exhibit
154D.	Document entitled "High Buildings" containing general requirements for plan review and for checks in the field for inspectors, used by the Borough of Scarborough.
155A.	Document re: fire alarms, separations and standpipe systems, used by field inspectors in the Borough of Scarborough.
155B.	Borough of Scarborough Field inspection form re: sprinklers.
156A.	Fire alarm verification form completed by installer and given to inspector, in the Borough of Scarborough.
156B.	Emergency lighting verification form, completed by installer and given to inspector in the Borough of Scarborough.
157.	Letter dated January 31, 1983 from Seneca College of Applied Arts and Technology, pertaining to their two year diploma course and the proposed building inspection technicians' course.
158.	Curriculum vitae of Donal Baird.
159.	Fire statistics for the years 1976 to 1981, inclusive, and the role of smoke detectors, as prepared by Ontario Housing Corporation.
160.	Ontario Housing Corporation field manual no. 1 — "Policies and Administration," chapter 13, section 10, April 1, 1978.
160A.	Ontario Housing Corporation field manual, chapter 11, "Safety," and a covering letter from Mr. Beesley of the Ontario Housing Corporation, dated April 5, 1983.
161.	Portion of Ontario Housing Corporation field manual no. 1 — "Fire Safety Plan," chapter 13, section 17, dated March 1, 1980.
162.	Portion of Ontario Housing Corporation field manual — "Electrical Fire Equipment," chapter 14, section 6, dated March 1, 1977.
163.	Consultants' guide to fire alarm and emergency system upgrading programme, dated February 1, 1982, Ontario Housing Corporation.
164.	Ontario Housing Corporation, Residents' guide — seniors.
165.	Ontario Housing Corporation, Residents' guide — families.
166.	Letter dated January 31, 1983, from Mr. Beesley re: Ontario Housing Corporation upgrading and deficiencies.
167.	Letter dated February 16, 1983 from Mr. Beesley, re: major problems in sprinkler systems; disconnected smoke detectors; caretakers' qualifications.

Exhibit Number	Description of Exhibit
168.	Curriculum vitae of Peter Goering.
169.	Curriculum vitae of Byron Johnson.
170.	Curriculum vitae of Gerhard Granek.
171.	Curriculum vitae of Jake (J. L.) Pauls.
172.	Document entitled, "Objects and Activities of Building Use and Safety Institute" dated January 24, 1983.
173.	Document entitled, "Guidelines for Occupant Safety, Government-owned Buildings", Ministry of Government Services, Province of Ontario.
174.	Document entitled, "Building Emergency Evacuation Programme", Ministry of Government Services, Province of Ontario.
175.	Document entitled, "Emergency Evacuation Programme" Ministry of Government Services, Province of Ontario.
176.	Document entitled, "Building Emergency Evacuation Program — Disabled Persons", Ministry of Government Services, province of Ontario.
177.	Document entitled, "Building and Fire Safety Report", Ministry of Government Services, Property Management Branch.
178.	Curriculum vitae of John R. Bateman.
179.	Results of questionnaires sent to chief fire officials, re: fire safety plans, and fire drills. (See Appendix B.4)
180.	Attachments that relate to Exhibit 179.
181.	Curriculum vitae of Dr. John L. Bryan.
182.	Report entitled "Implications for Code and Behavior Models from the Analysis of Behavior Response Patterns in Fire Situations as selected from the Project People and the Project People II study programs," by Dr. John L. Bryan. (see bibliography)
183.	Report entitled, "An Examination and Analysis of the Dynamics of the Human Behaviour in the MGM Grand Hotel Fire", by Dr. John L. Bryan. (see bibliography)
184.	Investigative report of the MGM Grand Hotel fire, by Richard Best and David P. Demers. (see bibliography)
185.	Dr. Ann Cavoukian's report on Highrise Fire Safety Questionnaire conducted in apartment buildings and hotels. (See Appendix B.4)
186.	California Senate Bill number 703, and attached documents dealing primarily with the authorization of local fire agencies to annually inspect highrise buildings.
187.	The results of a questionnaire sent to owners and managers of highrise buildings, to which is attached

Exhibit Number	Description of Exhibit
	appendices A, B, C and D, which include the questionnaire, the covering letter and certain materials forwarded from the respondents. (See Appendix B.4)
188.	Report by A.W. Chow re: burn tests conducted in Fort Lauderdale, Florida, September 8th to 10th, 1982.
188A.	A letter dated March 4, 1983 from Canadian Automatic Sprinkler Association to Anthony Chow, commenting on Exhibit 188.
189.	*Standards Council of Canada Act*, Revised Statutes of Canada, 1970, 1st Supplement, c. 41.
190.	Random collection of fire safety information for occupants of highrise buildings.
191.	Letter from Help Products Limited dated February 18, 1983 and letter attached thereto from the Korean Fire Protection Association.
192.	Letter from the City of Ottawa Fire Department dated February 7, 1983; attachments include smoke detector by-law.
193.	Senate Bill #214 for the State of Nevada.
193A.	"Nevada's Retrofit Package" by T. J. Huddleston, Nevada State Fire Marshal. (see bibliography)
194.	Chicago Fire Department Air/Sea Rescue policy guidelines for activation and utilization of aircraft assistance plan.
195.	Helicopter Emergency Lifesaver Plan (HELP), Dallas/Fort Worth.
196.	Two documents produced by City of Houston re: Aircraft Assistance in Disaster Plan (AAID).
197.	Document entitled "Helicopter News" which illustrates certain helicopters available in Ontario, with load capacities.
198A.	*Professional Engineers Act*, Revised Statutes of Ontario, 1980 c. 394.
198B.	Pamphlet from Association of Professional Engineers of the Province of Ontario entitled, "To Serve and Defend."
198C.	Regulations, by-laws, code of ethics of Association of Professional Engineers of the Province of Ontario, as amended September, 1981.
198D.	Document entitled, "Performance Standards for Professional Engineers acting as Prime Consultants."
199.	Underwriters' Laboratories of Canada background pamphlet.
200.	Underwriters' Laboratories of Canada sample label.
201.	Memorandum re: significance of Underwriters' Laboratories of Canada label.

Exhibit Number	Description of Exhibit
202.	U.L.C. List of materials and equipment, March 1981, Volume I and supplement.
203.	U.L.C. List of materials and equipment, September 1980, Volume II and supplement.
204.	National Standard of Canada, Can-4 S101 M82, Standard methods of fire endurance tests of buildings construction materials.
205.	National Standard of Canada, Can-4 S102 M80, Standard method of test for surface burning characteristics of building materials.
206.	1981 Toronto Fire Department annual report.
207.	Letter and attached report re: false alarms from the Ministry of Municipal Affairs and Housing, Research and Development Section, dated January 5th, 1983, addressed to the General Manager of the Metro Toronto Housing Authority.
208.	Copy of a memorandum to A. W. Chow of the Ontario Fire Marshal's Office from Director J. Underwood of the Toronto Fire Department dated October 8th, 1982 re: false alarms in apartment buildings.
209.	Document entitled, "Ontario Fire Code, Charges and their Disposition" dated October 21, 1982.
210.	A copy of the decision of the Ontario Court of Appeal in the matter of *Her Majesty the Queen v. Harold Sandler,* [1971] 3 O. R. 614
211.	Curriculum vitae of Rashmi Nathwani.
212.	Letter from G. Adams, Technical Standards Division of Ministry of Consumer and Commercial Relations to Mr. M. Nixon, Commissioner and Chief Building Official of City of Toronto dated February 2, 1983, with attached list of provincial statutes pertaining to building.
213.	A chart comparing the *Theatres Act, Occupational Health & Safety Act, Nursing Homes Act* and the *Hotel Fire Safety Act.*
214.	Letter from Office of the Fire Marshal of Ontario to Mr. Nixon of the City of Toronto dated February 19, 1982 re: theatre inspections.
215.	Retrofit cost analysis by the City of Toronto.
216. (a)-(d)	Papers and articles pertaining to toxicity of products of combustion.
217.	List of smoke control measures used in new construction in Toronto 1976 to mid-1982.
218.	City of Toronto Land Use Committee report number 4, item 14 dealing with building code regulations on locked stairwells.

Exhibit Number	Description of Exhibit
219.	Practice bulletin number 12 of the Ontario Association of Architects re: General Review During Construction.
220.	Specifications for retrofit for two apartment buildings, prepared by Dunlop, Farrow, Aitken.
221.	Curriculum vitae of Robert T. Myles.
222.	Brochure, "Profile: Hanscomb."
223.	Cost report entitled, "Retrofit of Existing Apartment Buildings", prepared by Hanscomb, January, 1983.
224.	Dunwoody and Co., Auditor's report dated February, 1983 re: a specific MURB project.
225.	Apartment retrofit study: Sprinklering on sample projects, prepared by Hanscomb.
226.	That portion of the 1979 draft Ontario Fire Code, as circulated for public comment, containing the report of Advisory Committee, and Minority report.
227.	Three-part form entitled, "Preventive Maintenance Report, Fire Alarm System", used by Maysfield Property Management Inc.
228.	Urban Development Institute fire safety plan.
229.	City of Mississauga fire safety pamphlet.
230.	Letter from Mr. McFadden of the Toronto Fire Department dated January 5, 1983 to Cadillac-Fairview, re: fire safety planning.
231.	Letter from Maysfield Property Management Inc. addressed to "Dear Resident" re: fire safety rules.
232.	Schematic plan of fire control system (Urban Development Institute).
233.	Fire drill instructions for buildings superintendents. (Urban Development Institute)
234.	Curriculum vitae of Donald J. Boehmer.
235.	A study brief by Donald J. Boehmer of Rolf Jensen & Associates Ltd., March 31, 1983.
236.	Computer printout from Fire Marshal's Office, details of highrise fires, 1976-1981, inclusive.
237.	Curriculum vitae of Jack Gringorten.
238.	Fire drill procedures, Olympia and York, dated November 11, 1982.
239.	EAO guidelines, covering letter and Emergency action plan from Olympia and York to new tenants.
240.	Letter received by the Commission from the City of North York, dated March 25, 1983, enclosing a copy of clause 5, Legislation Committee report number 6, re: the use of plastic pipe in the building industry.

Exhibit Number	Description of Exhibit
241.	Letter dated March 4, 1983 from Seneca College re: life safety course.
242.	Curriculum vitae of George B. Tatham.
243.	Membership booklet of Building Owners and Managers Association.
244.	Fire survey, 1974 to 1980, by Buildings Owners and Managers Association, International.
245A.	National Bank fire safety plan.
245B.	Continental Bank fire safety plan.
245C.	Richmond-Adelaide Center fire safety plan.
245D.	Pamphlet entitled, "Emergency Procedures, Oxford, Eastern Canada Division."
246.	Table of causes of death in Ontario, derived from Statistics Canada.
247.	Curriculum vitae of John W. Fothergill, Jr.
248.	Paper by John W. Fothergill, Jr., entitled, "Smoke Movement Within a Building."
249.	Curriculum vitae of Harry Shaw.
250.	Duraspeed sprinkler head, without deflector, with 165 degrees Fahrenheit solder.
251.	Raynell quick response sprinkler head.
252.	Industrial sprinkler head, quick response.
253.	Residential sprinkler head, sidewall, quick response, NFPA 13D.
254.	NFPA Standard 13D, sprinkler system-one and two-family dwellings.
255.	Document entitled, "Field Test of a Retrofit Sprinkler System at Fort Lauderdale" dated February, 1983.
256.	A brochure from Grinnell Fire Protection Systems Company with reference to Cobb County Sprinkler Systems.
257.	Curriculum vitae of Walter William Miller.
258.	Curriculum vitae of Douglas Howes.
259.	Curriculum vitae of Alvin McBride.
260.	Revised Regulations of Ontario 58/80 re: sprinkler and fire protection installers, *Apprenticeship and Tradesmen's Qualification Act.*
261.	Curriculum vitae of William Kennaley.
262.	Regulations pursuant to *the Fire Prevention Act,* R.S.N.S., 1967, c.107, s.[illegible]3, re: automatic sprinklers.
263.	Regulation 63/79, pursuant to the *Fire Prevention Act,* (Saskatchewan) re: automatic sprinklers.

Exhibit Number	**Description of Exhibit**
264.	Reports of fires in sprinklered buildings in Vancouver, 1979, 1980 and 1981, and summary.
265.	Curriculum vitae of Fred Bever.
266.	*Residential Tenancies Act,* Revised Statutes of Ontario, 1980, c. 452, s. 131.
267.	Rent review guidelines, number RR-3, dated November 17, 1982.
268.	Calculation of apartment units to 1975 and post-1975, Central Mortgage and Housing Corporation source material.
269.	Letter dated March 30, 1983 from Mr. Hansen of the National Research Council addressed to the Commission with reference to Part 3 of the National Building Code. (disabled persons)
270.	Booklet entitled, "Environmental Modifications for the Visually Impaired—a Handbook" published by the American Foundation for the Blind.
271.	Letter dated March 18, 1983 from Mr. Davidson of Ontario Hydro addressed to the Commission re: proposed amendment to CSA Standard 282 and the electrical code.
272.	Letter dated April 11, 1983 from Dr. Viau, addressed to the Commission concerning self-extinguishing cigarettes, labelling of furniture and flame retardant.
273.	Research memorandum dated January 21, 1983 from Becky Quance, re: research concerning emergency communication over cable TV.
274.	Research memorandum dated February 15, 1983 from Becky Quance re: use of National Building Code across Canada.
275.	Research memorandum dated February 15, 1983 from Becky Quance re: use of National Fire Code across Canada.
276.	Copies of nine letters addressed to Mr. Fillingham from various provinces re: legislative requirements for sprinklers.
277.	Letter dated February 28, 1983 from the Boston Fire Department pertaining to control of decorations, furnishings and interior finish.
278.	National Fire Protection Association investigation report dated March 6, 1982 relating to the fire at the Westchase Hilton Hotel in Houston, Texas.
279.	Letter dated March 3, 1983 from the ECE Group Limited to the Commission enclosing a copy of the report to Urban Development Institute concerning control of smoke movement in high buildings, dated November 23, 1970.

Exhibit Number	Description of Exhibit
280.	Report by Byron Johnson, dated March, 1983, entitled, "Evacuation Techniques for Disabled Persons." (see bibliography)
281.	Letter dated April 21, 1983 from the Etobicoke Fire Department re: the fire at 21 Richgrove Drive, Apartment 705, Etobicoke, on April 19th, 1983.
282.	The Floor plan, A Wing, Sunnybrook Hospital, City of North York.
283.	Floor plan, Apartment 1004, 20 Falstaff, and hall plan of 10th floor, 20 Falstaff, City of North York.
284.	Letter dated March 16, 1983 from Chief Gibson, of the City of North York Fire Department, together with the attachments, re: order made pursuant to *Fire Marshals Act*, s.18.
285.	Fire Marshal's order dated July 9, 1982. (sample of actual order issued)
286.	Booklet entitled, "The Guidelines for Preparation of Fire Safety Plans for Residential Buildings" prepared by the Office of the Fire Marshal. (see bibliography)
287.	Document dated March 22, 1983, part 9, Retrofit, sections 9.1; 9.2; and 9.3 of Ontario Fire Code, and filed as Ontario Regulation 251/83 on April 29, 1983.
288.	Fire prevention inspection manual of the Solicitor General's Office, March, 1983.
289.	Document dated March 2, 1983, section 9.4, Health care facilities. (Draft amendments to part 9 related to Retrofit in Ontario Fire Code)
290.	Letter dated April 5, 1983 to Mr. Cooper, Executive Director, Ontario Hotel and Motel Association from Mr. Hess, Office of the Fire Marshal, re: training of hotel management and staff.
291.	Looseleaf book containing the Hotel Fire Safety Seminar Course content for hotel fire safety specialists.
292.	Draft sample pamphlet entitled, "How to Survive a Hotel Fire" prepared by Office of the Fire Marshal.
293.	Fire Marshal's Office sign for hotels where there is a general evacuation alarm system.
294.	Fire safety sign for hotels with a two-stage alarm system (Office of the Fire Marshal).
295.	Local law number 5 for the City of New York; also local laws numbers 79, 84, 86 re: fire safety; and a copy of a decision of Appellate Division, Supreme Court of New York, *McCallin* v. *Walsh, et al.* 407 New York Supplement, 2d Series 852.
296.	Research memorandum dated March 2, 1983, by Becky Quance and Kate Murphy re: Water gel blanket; effect of present regulatory system on a specific product.

Exhibit Number	Description of Exhibit
297.	Letter dated May 2, 1983 from the Firefighters' Association of Ontario to the Commission re: the work of the Commission.
298.	Article entitled, "Overview — Smoke Control Manual" by John H. Klote. (see bibliography)
299.	NFPA position paper by Robert Grant, President of NFPA, entitled, "Smoke Masks Not Recommended". (see bibliography)
300.	Document entitled, "Literature Review; Flame-retardant Chemicals in Textiles," by A. G. Ulsamer et al., and produced by the Consumer Products Safety Commission in Washington, D. C. (see bibliography)
301.	Letter from Dr. Viau, to the Commission dated May 12, 1983 re: P.T.E. formula 111.
302.	Letter from E. M. Tuff of Otis Elevator Company Limited to the Commission dated April 29, 1983, re: NBC requirements affecting elevators.
303.	Letter from the City of Toronto to the Commission dated May 11, 1983 with reference to undertakings made during the evidence of Mr. Nathwani and Mr. Sproule.
304.	Letter from the Canadian Automatic Sprinkler Association to the Commission dated May 6, 1983, pertaining to the undertakings made during evidence of Mr. Kennaley.
305.	List of statutes in the Province of Ontario pertaining to fire safety and building matters prepared by Commission staff, and a memorandum by Kate Murphy breaking the list into six classifications.
306.	Memorandum from the Technical Secretary of the Standing Committee on Use and Occupancy Part 3, of National Research Council of Canada, addressed to the Task Group on High Buildings, received on May 13, 1983 by the Ontario Fire Marshal's Office, re: the disbanding of the Highrise Task Group, and the preparation of a paper on mandatory sprinkling.
307.	Newsletter, March 1983, by Ministry of Municipal Affairs and Housing, re: Building Code Commission's opinion on the standard to be met in installations exceeding the Building Code requirements.
308.	Letter dated May 13, 1983 from the Fire Marshal's Office to the Commission re: the convictions under the Ontario Fire Code up to May 6, 1983, in the City of Toronto.
309.	Research memorandum by Kate Murphy, dated May 18, 1983, pertaining to central station connections and the cost thereof.

Exhibit Number	Description of Exhibit
310.	Letter dated May 19, 1983 from the City of Toronto Department of Buildings and Inspections to the Commission, which is a review of legislation concerning building and fire standards.
311.	Letter dated May 16, 1983 from McFadden, Marrocco and Parker, enclosing the report of May, 1982 pertaining to the *Fire Marshals Act,* the *Building Code Act* and the Property Standards by-laws passed pursuant to the Planning Act.
312.	Letter from M & M Protection Consultants to the Commission dated May 5, 1983, enclosing an article entitled "Highlights of a Field Test of Retrofit Sprinkler Systems", by Arthur Cote. (see bibliography)
313.	Letter to a George H. Fleming from the Ministry of Energy and attachments re: curriculum of course for Building Officials.
314.	Report of Beth S. Tate to R. R. Philippe, Office of the Fire Marshal re: First Canadian Place fire, dated November 16, 1983.
315.	Report to the Ministry of Municipal Affairs and Housing, and to the Ontario Association of Property Standards Officers Inc. on Provincial and Municipal Legislation and Administration Relating to Buildings prepared by McFadden, Marrocco & Parker, Barristers and Solicitors, dated June, 1983.
316.	Statement of James C. Stevens, Special Projects Engineer, Office of the Fire Marshal re: fire at 170 Lees Avenue, Ottawa, dated June 30, 1983.
	Report of Gordon H. Yoshida, Office of the Fire Marshal, re: fire at 170 Lees Avenue, Ottawa, dated August 9, 1983.

Appendix A.8

PUBLIC NOTICE

Ontario

Commission of INQUIRY into FIRE SAFETY IN HIGHRISE BUILDINGS in Ontario

By Order-in-Council dated the 30th day of June, 1982, His Honour Judge John B. Webber was appointed pursuant to the Public Inquiries Act, R.S.O. 1980, to:

1. assess the dangers to which occupants are exposed when a fire occurs in a highrise building;
2. to assess the public's understanding of the action that should be taken in the event of a fire and evaluate the need for public education programs; and to assess the public's perception as to whether occupancy of highrise buildings is especially hazardous and if so, why;
3. to assess the value of fire safeguards required by law;
4. to examine the effectiveness of fire prevention inspections conducted in highrise buildings by public and private agencies;
5. to recommend changes to laws or practices and procedures and make such other recommendations as may be appropriate with a view to improving the standard of fire safety in highrise buildings.

Notice of Hearing

The first session of the Commission will be convened on Monday, the 13th day of September, 1982, at the hour of 10:00 o'clock in the forenoon, Hearing Room #1, 21st Floor, 180 Dundas Street West, Toronto, Ontario, for the purpose of establishing procedures and granting standing to interested individuals and organizations. Anyone intending to participate in the Commission's hearings is invited to attend and may make submissions at the above noted time.

Parties granted standing may call witnesses, conduct cross-examinations and make submissions. Any party who seeks standing should apply in writing to the Commission by September 13th, 1982, or appear at the hearing scheduled for that date. In all instances, applicants should state why they seek standing and why they believe they have a substantial and direct interest in the subject matter of the inquiry.

Any party, with or without standing, may make written submissions to the Commission.

The Commission seeks opinions, comments and information from all interested individuals and organizations.

The dates, times and places of public hearings will be announced later.

COMMISSION OF INQUIRY INTO
FIRE SAFETY IN HIGHRISE BUILDINGS
IN ONTARIO,
Ste. 2005, 180 Dundas Street West
Toronto, Ontario M5G 1Z8
Telephone: (416) 963-2924
His Honour Judge John B. Webber,
Commissioner,
Victor L. Freidin,
Counsel to the Commission

Appendix A.9

COUNSEL APPEARING BEFORE THE INQUIRY

Mr. L. H. Iron, Q. C.	— Counsel for PTE Industries Inc.
Mr. Karl Jaffary, Q. C. and Mr. John Petrosoniak (student-at-law)	— Counsel for Urban Development Institute, Apartment Group; Housing and Urban Development Association of Canada, Ontario Council; Metropolitan Toronto Apartment Builders Association.
Ms. A. T. Kowalishin	— Counsel for City of Toronto.
Mr. L. Margulies	— Counsel for Berhold Investments Ltd.
Mr. B. S. Onyschuk, Q. C. and Mr. C. MacFarlane	— Counsel for Canadian Institute of Public Real Estate Companies; International Council of Shopping Centres, Canadian Committee; and Building Owners and Managers Association.

AGENTS APPEARING BEFORE THE INQUIRY

Ms. Mary Ann Cummings and Mr. Christopher Dassios	Parkdale Community Legal Services for Federation of Metropolitan Toronto Tenants' Associations

PART B: RELATED TO RESEARCH

Appendix B.1

REVISED STATUTES OF ONTARIO, 1980
RE: FIRE SAFETY & BUILDING MATTERS

1. Accidental Fires Act, Chapter 4
2. Apprenticeship & Tradesmen's Qualification Act, Chapter 24
   Regulations — R.R.O. 1980, Reg. 58
3. Boilers and Pressure Vessels Act, Chapter 46
4. Building Code Act, Chapter 51
   Regulations — R.R.O. 1980, Reg. 87
5. Charitable Institutions Act, Chapter 64
   Regulations — R.R.O. 1980, Reg. 95
6. Children's Institutions Act, Chapter 67
   Regulations — R.R.O. 1980, Reg. 98
7. Children's Mental Health Services Act, Chapter 69
   Regulations — R.R.O. 1980, Reg. 100
8. Children's Residential Services Act, Chapter 71
   Regulations — R.R.O. 1980, Reg. 101
9. Community Psychiatric Hospitals Act, Chapter 79
10. Day Nurseries Act, Chapter 111
    Regulations — R.R.O. 1980, Reg. 235
11. Developmental Services Act, Chapter 118
    Regulations — R.R.O. 1980, Reg. 242
12. Egress from Public Buildings Act, Chapter 130
13. Elderly Persons Centres Act, Chapter 131
    Regulations — R.R.O. 1980, Reg. 278
14. Elevating Devices Act, Chapter 135
15. Energy Act, Chapter 139
    Regulations — R.R.O. 1980, Reg. 288
16. Fire Accidents Act, Chapter 163
17. Fire Departments Act, Chapter 164
18. Fire Marshals Act, Chapter 166
    Regulations — R.R.O. 1980, Reg. 394
19. Gasoline Handling Act, Chapter 185
20. Highway Traffic Act, Chapter 198
21. Hotel Fire Safety Act, Chapter 207
    Regulations — R.R.O. 1980, Reg. 505
22. Homes for Retarded Persons Act, Chapter 201

23. Homes for Special Care Act, Chapter 202
    Regulations — R.R.O. 1980, Reg. 501
24. Homes for the Aged & Rest Homes Act, Chapter 203
    Regulations — R.R.O. 1980, Reg. 502
25. Lightning Rods Act, Chapter 239
26. Liquor Licence Act, Chapter 244
    Regulations — R.R.O. 1980, Reg. 581
27. Mental Hospitals Act, Chapter 263
28. Municipal Act, Chapter 302
29. Nursing Homes Act, Chapter 320
    Regulations — R.R.O. 1980, Reg. 690
30. Occupational Health & Safety Act, Chapter 321
    Regulations — R.R.O. 1980, Reg. 691
31. Ontario Water Resources Act, Chapter 361
    Regulations — R.R.O. 1980, Reg. 736
32. Pesticides Act, Chapter 376
    Regulations — R.R.O. 1980, Reg. 751
33. Power Corporation Act, Chapter 384
    Regulations — R.R.O. 1980, Reg. 794
34. Planning Act, Chapter 379
35. Private Hospitals Act, Chapter 389
36. Private Sanitaria Act, Chapter 391
37. Public Halls Act, Chapter 408
38. Public Health Act, Chapter 409
39. Public Hospitals Act, Chapter 410
    Regulations — R.R.O. 1980, Reg. 856
40. Public Institutions Inspection Act, Chapter 412
41. Theatres Act, Chapter 498
    Regulations — R.R.O. 1980, Reg. 931
42. Tourism Act, Chapter 507

The foregoing list can be roughly categorized as follows:

1) **statutes directed to tort liability:**
Accidental Fires Act
Fire Accidents Act
Lightning Rods Act; although this Act regulates the installment of lightning rods, it also limits the installer's civil liability in case of failure of the product.

2) **statutes directed to building, or the work of construction:**
Building Code Act (Building Code)
Egress from Public Buildings Act
Elevating Devices Act
Ontario Water Resources Act (Plumbing Code)
Planning Act; although this Act allows the municipality to pass by-laws with regard to use and occupancy, many of the matters referred to are, directly building code matters.
Note: Section 46, sub. 1, Sections 8, 12, 14, 24, 25, as examples.

Public Health Act; this Act gives different requirements for washrooms from those found in the Building Code.
Tourism Act

3) **statutes directed to fire matters:**
Fire Departments Act
Fire Marshals Act (Fire Code)
Municipal Act — Note Section 210, sentence 24 and following, as examples.

4) **statutes directed to both building &/or fire matters:**
(certain of these statutes have a Regulation Section that would allow the Lieutenant-Governor in Council to pass regulations dealing with building &/or fire matters, but do not presently have such regulations).

Charitable Institutions Act
Children's Institutions Act
Children's Mental Health Services Act
Children's Residential Services Act
Community Psychiatric Hospitals Act
Day Nurseries Act
Developmental Services Act
Elderly Persons Centres Act
Hotel Fire Safety Act
Homes for Retarded Persons Act
Homes for Special Care Act
Homes for the Aged & Rest Homes Act
Liquor Licence Act
Mental Hospitals Act
Nursing Homes Act
Occupational Health & Safety Act
Power Corporation Act
Private Hospitals Act
Private Sanitaria Act
Public Hospitals Act
Theatres Act

5) **statutes directed to flammable and combustible liquids/hazardous materials, processes and operations:**
Boilers and Pressure Vessels Act
Energy Act — handling of hydrocarbons
Gasoline Handling Act
Highway Traffic Act — transportation of explosives and dangerous materials
Pesticides Act — storage of flammable materials

6) **Miscellaneous:**
Apprenticeship and Tradesmen's Qualification Act — qualification of sprinkler fitters
Public Halls Act — requires a licence but does not list criteria
Public Institutions Inspection Act — citizens as "inspectors" in public buildings, as defined.

Appendix B.2

ABBREVIATIONS

ACNBC	Associate Committee on the National Building Code. (National Research Council of Canada — Ottawa, Ontario K1A 0R6)
ACNFC	Associate Committee on the National Fire Code. (National Research Council of Canada — Ottawa, Ontario K1A 0R6)
ANSI	American National Standards Institute. (1430 Broadway, New York, New York, U.S.A. 10018)
APEO	Association of Professional Engineers of the Province of Ontario. (1027 Yonge Street, Toronto, Ontario M4W 3E5)
ASHRAE	American Society of Heating, Refrigerating and Air-conditioning Engineers. (345 East 47th Street, New York, New York, U.S.A. 10017)
ASTM	American Society for Testing and Materials. (1916 Race Street, Philadelphia, Pa. U.S.A. 19103)
BOMA	Building Owners and Managers Association. (372 Bay Street, Ste. 1700, Toronto, Ontario M5H 2W9)
BOMI	Building Owners and Managers Institute. (372 Bay Street, Ste. 1700, Toronto, Ontario M5H 2W9)
BUSI	Building Use and Safety Institute. (Room 178, Building M50, National Research Council, Ottawa, K1A 0R8)
CAFC	Canadian Association of Fire Chiefs Inc. (1590-7 Liverpool Court, Ottawa, Ontario K1B 4L2)
CASA	Canadian Automatic Spinkler Association. (640 Hood Road, Markham, Ontario L3R 3K9)
CFAA	Canadian Fire Alarm Association. (55 Idema Road, Markham, Ontario L3R 1A9)
CIPREC	Canadian Institute of Public Real Estate Companies. (390 Bay Street, Ste. 2806, Toronto, Ontario M5H 2Y2)
CNIB	Canadian National Institute for the Blind. (1931 Bayview Avenue, Toronto, Ontario M4G 4C8)
CGSB	Canadian Government Specifications Board. (c/o Department of Supply and Services, 88 Metcalfe Street, Ottawa, Ontario K1A 0S5)
CSA	Canadian Standards Association. (178 Rexdale Blvd., Rexdale, Ontario M9W 1R3)
DBR/NRC	Division of Building Research, National Research Council of Canada. (National Research Council of Canada, Ottawa, Ontario K1A 0R6)

FHAP	Federal Housing Action Program (101 Bloor Street, Toronto, Ontario M5S 1P8)
FMTA	Federation of Metropolitan Tenants' Associations. (366 Adelaide St. E., Ste. 233, Toronto, Ontario M5A 3X9)
HUDAC	Housing and Urban Development Association of Canada (Ontario Council). (5218 Yonge Street, Willowdale, Ontario M2N 5P7)
IAO	Insurers Advisory Organization. (180 Dundas Street West, Ste. 2600, Toronto, Ontario M5G 1Z8)
ICSC	International Council of Shopping Centres. (Box 375, Royal Trust Tower, Toronto, Ontario M5K 1K8)
LPMA	The London Property Management Association. (London, Ontario 672-8240)
MTABA	Metropolitan Toronto Apartment Builders Association. (150 Consumers Road, Ste. 402, Willowdale, Ontario M2J 1P9)
MTHC	The Metropolitan Toronto Housing Company. (110 Eglinton Avenue East, Toronto, Ontario M4P 2Y1)
NBC	National Building Code of Canada. (National Research Council of Canada, Ottawa, Ontario K1A 0R6)
NCPA	National Concrete Producers Association. (1013 Wilson Avenue, Downsview, Ontario M3K 1G1)
NFC	National Fire Code of Canada. (National Research Council of Canada, Ottawa, Ontario K1A 0R6)
NFPA	National Fire Protection Association. (470 Atlantic Avenue, Boston, Massachusetts, U.S.A. 02210)
NRC	National Research Council of Canada. (Ottawa, Ontario K1A 0R6)
OAA	Ontario Association of Architects. (50 Park Road, Toronto, Ontario M4W 2N5)
OBC	Ontario Building Code.
OBOA	Ontario Building Officials Association Inc. (150 Central Park Drive, Brampton, Ontario L6T 2T9)
OCBA	Ontario Concrete Block Association. (1013 Wilson Avenue, Downsview, Ontario M3K 1G1)
OFC	Ontario Fire Code.
OHAP	Ontario Housing Action Program. (444 Lumsden Avenue, Toronto, Ontario M4G 2L8)
OHC	Ontario Housing Corporation. (444 Lumsden Avenue, Toronto, Ontario M4G 2L8)
OMFPOA	Ontario Municipal Fire Prevention Officers Association. (5815 Morrison Street, Niagara Falls, Ontario L2E 2E8)
OPFFA	Ontario Professional Fire Fighters Association. (555 Burnhamthorpe Road, Ste. 210, Etobicoke, Ontario M9C 2Y3)
PACNBC	Provincial Advisory Committee on the National Building Code. (National Research Council of Canada, Ottawa, Ontario K1A 0R6)

SCC	Standards Council of Canada. (350 Sparks Street, Ottawa, Ontario K1R 7S8)
SFPE	Society of Fire Prevention Engineers. (141 Adelaide Street West, Ste. 406, Toronto, Ontario M5H 3L5)
TBSA	Toronto Building Superintendents' Association. (P.O. Box 5214, Station A, 17 Front Street West, Toronto, Ontario M5W 1N5)
TDPL	Third Degree Prevention Ltd. (2650 John Street, Unit 22, Markham, Ontario L3R 2W6)
UDI	Urban Development Institute. (60 Bloor Street West, Ste. 1203, Toronto, Ontario M4W 3B8)
UL	Underwriters' Laboratories, Inc. (207 East Ohio Street, Chicago, Ill. U.S.A. 60611)
ULC	Underwriters' Laboratories of Canada. (7 Crouse Road, Scarborough, Ontario M1R 3A9)

Appendix B.3

DEFINITIONS

The following definitions are common to the Ontario Fire Code and the Ontario Building Code, with these exceptions:

* Ontario Fire Code only
** Ontario Building Code only
*** developed from the evidence by Commission staff

Alarm signal:	a signal indicating an emergency such as an alarm for fire from a manual box, a water flow alarm, an alarm from an automatic fire alarm system or other emergency signal.**
Assembly occupancy:	the occupancy of a building, or part thereof, by a gathering of persons for civic, political, travel, religious, social, educational, recreational or like purposes, or for the consumption of food or drink. (Group A)
Building height:	the number of storeys contained between the roof and the floor of the first storey.
Business and personal services occupancy:	the occupancy of a building or part thereof for the transaction of business or the rendering or receiving of professional or personal services. (Group D)**
Check:	visual observation to ensure the device or system is in place and is not obviously damaged or obstructed.*
Chief Fire Official:	the Municipal Fire Chief or where there is no fire department, such assistant to the Fire Marshal as the Fire Marshal may designate for the Municipality or territory without municipal organization.*
Closure:	a device for shutting off an opening through a construction assembly, such as a door or a shutter, and includes all components such as hardware, frames and anchors.
Designer:	the person responsible for the design.**
Dwelling unit:	a room or suite of rooms used or intended to be used as a domicile by one or more persons and usually containing cooking, eating, living, sleeping and sanitary facilities.
Electrically supervised control valve:	a valve permanently fitted with a mechanical device to actuate electrical contacts upon initiation of valve actuation.**
Exit:	that part of a means of egress that leads from the floor area it serves, including any doorway leading directly from a floor area, to a public thoroughfare or to an open space.
Exit, access to:	that part of a means of egress within a floor area that provides access to an exit serving the floor area.*

Exit level:	the lowest level in an enclosed exit stairway from which an exterior door provides access to a public thoroughfare or to an open space with access to a public thoroughfare at approximately the same level either directly or through a vestibule or exit corridor.**
Fire compartment:	an enclosed space in a building that is separated from all parts of the building by enclosing construction providing a fire separation having a required fire-resistance rating.
Fire damper:	a closure which consists of a normally held open damper installed in an air distribution system or in a wall or floor assembly, and designed to close automatically in the event of a fire in order to maintain the integrity of the fire separation.
Fire load:	the combustible contents of a room or floor area expressed in terms of the average weight of combustible materials per square foot, and includes the furnishings, finished floor, wall and ceiling finishes, trim and temporary and movable partitions.**
Fire prevention:	action taken to prevent fires. When used in relation to fire departments, it describes the function of fire department personnel who conduct building inspections, disseminate fire prevention literature, and engage in other pre-fire safety activities. In larger centres, this function is often performed by full-time fire prevention officers.***
Fire-protection rating:	the time in hours or fraction thereof that a closure, window assembly or glass block assembly will withstand the passage of flame when exposed to fire under specified conditions of test and performance criteria.
Fire resistance:	the property of a material or assembly to withstand fire or give protection from it and when it is applied to elements or buildings, it is characterized by the ability to confine a fire or to continue to perform a given structural function, or both.
Fire-resistance rating:	the time in hours or fraction thereof that a material or assembly of materials will withstand the passage of flame and the transmission of heat when exposed to fire under specified conditions of test and performance criteria, or as determined by extension or interpretation of information derived therefrom.
Fire safety plan:	a written plan prepared by a building owner containing provisions for maintenance, evacuation procedures, and other important essentials for life safety within buildings. The minimum requirements for such plans are contained in OFC Section 2.8.***
Fire separation:	a construction assembly that acts as a barrier against the spread of fire and may not be required to have a fire-resistance rating or a fire-protection rating.
Fire stop:	a draft-tight barrier within or between construction assemblies that acts to retard the passage of smoke and flame.

Fire stop flap:	a device intended for use in horizontal assemblies required to have a fire-resistance rating and incorporating protective ceiling membranes, which operates to close off a duct opening through the membrane in the event of a fire.
Fire suppression:	acts which extinguish flame. When used in relation to the fire department, it describes the function performed by fire-fighters who extinguish fires. In terms of equipment, it refers to any device which automatically extinguishes fires (e.g., sprinklers) or is operated manually for that purpose (e.g. fire extinguishers).***
Flame-spread rating:	an index or classification indicating the extent of spread-of-flame on the surface of a material or an assembly of materials as determined in a standard fire text as prescribed in this Regulation.
Grade:	the average level of proposed or finished ground adjoining a building at all exterior walls.
Heat detector:	a device for sensing an abnormally high air temperature or an abnormal rate of heat rise and automatically initiating a signal indicating this condition.**
Independent central station:	a continually supervised station under the control of a company independent of the owners of the building to be protected, that conforms with NFPA 71-1972, "Installation, Maintenance and Use of Central Station Protective Signalling Systems for Guard, Fire Alarm and Supervisory Service".
Inspect:	physical examination to determine that the device or system will apparently perform in accordance with its intended function.*
Institutional occupancy:	the occupancy of a building or part thereof by persons who because of age, mental or physical limitations require special care or treatment or by persons involuntarily detained or whose liberties are restricted. (Group B)**
Institutional occupancy:	the occupancy or use of a building or part thereof by persons harboured or detained to receive medical care or treatment, or by persons involuntarily detained. (Group B)*
Licence:	permission or authorization in writing by the Chief Fire Official to carry out activities regulated by the Fire Code.*
Listed:	certified for its intended use as having been produced under the certification program of Underwriters' Laboratories of Canada or Canadian Standards Association.
Major occupancy:	the principal occupancy for which a building or part thereof is used or intended to be used, and shall be deemed to include the subsidiary occupancies which are an integral part of the principal occupancy.**

Means of egress: a continuous path of travel provided by a doorway, hallway, corridor, exterior passageway, balcony, lobby, stair, ramp or other egress facility or combination thereof, for the escape of persons from any point in a building floor area, room or contained open space to a public thoroughfare or other open space and includes exits and access to exits.

Mercantile occupancy: the occupancy or use of a building or part thereof for the displaying or selling of retail goods, wares or merchandise. (Group E)

Noncombustible: material that conforms to CSA B54.1-1972, "Determination of Non-Combustibility in Building Materials".

Noncombustible construction: that type of construction in which a degree of fire safety is attained by the use of non-combustible materials for structural members and other building assemblies.

Occupant: any person, firm, or corporation who is jointly responsible with an owner in respect of the property under consideration over which the occupant has control.

Occupancy, major: the principal occupancy for which a building or part thereof is used or intended to be used, and shall be deemed to include the subsidiary occupancies which are an integral part of the principal occupancy.*

Owner: any person, firm or corporation controlling the property under consideration.

Permit: permission or authorization in writing by the Chief Fire Official to demolish a building or part thereof or to retrofit a building or premises or to install or replace equipment to the requirements of the Fire Code.*

Plenum: an air compartment or chamber which may have one or more ducts connected to it and which forms part of an air distribution system.**

Pre-fire plan: fire department response for specific building or building type.***

Products of combustion detector: a device for sensing the presence of visible or invisible particles produced by combustion and automatically initiating a signal indicating this condition.**

Proprietary control centre: a continually supervised station under the control of the owner or others interested in the building or buildings to be protected that conforms with Class A proprietary signalling systems in NFPA 72D-1973, "Installation, Maintenance and Use of Proprietary Protective Signalling Systems for Guard, Fire Alarm and Supervisory Service".**

Public corridor: a corridor that provides access to exit from individually rented rooms, suites of rooms or dwelling units.

Residential occupancy: the occupancy or use of a building or part thereof by persons for whom sleeping accommodation is provided but who are not harboured or detained to receive medical care or treatment or are not involuntarily detained. (Group C)**

Retrofit:	the minimum performance requirements for life safety for all existing buildings.* Also used to describe the upgrading of existing buildings (mandatory or voluntary).
Service space:	space provided in a building to facilitate or conceal the installation of building service facilities such as chutes, ducts, pipes, shafts or wires.**
Smoke detector:	a device for sensing the presence of visible or invisible particles produced by combustion, and automatically initiating a signal indicating this condition.**
Smoke control:	the provision of safe conditions for the occupants of a high building who may have to remain in the building during a fire, by protecting exit routes and by assisting firefighters with provision of efficient access to the fire floor as required by NBC/OBC, Section 3.2.6.***
Smoke control measures:	Detailed measures that may be incorporated in a building in order to comply with the requirements relating to control of smoke that are included in Subsection 3.2.6 of the NBC. The measures identified are not meant to exclude other means of attaining the same objectives.***
Smoke venting:	the means used by firefighters to remove smoke from a building. Minimum requirements for such venting in highrise buildings are contained in OBC 3.2.6.5.***
Sprinklered:	that the building or part thereof is equipped with a system of automatic sprinklers.
Storey:	that portion of a building which is situated between the top of any floor and the top of the floor next above it, and if there is no floor above it, that portion between the top of such floor and the ceiling above it.
Supervisory signal:	a signal indicating the need for action in connection with the supervision of sprinkler and other extinguishing systems or equipment, or with the maintenance features of other protection systems.**
Supervisory staff:	the occupants of a building who have some delegated responsibility for the fire safety of other occupants under the fire safety plan and may also refer to the local fire department where it assumes these responsibilities.*
Supply duct:	a duct for conveying air from a heating, ventilating or air conditioning appliance to a space to be heated, ventilated or air-conditioned.**
Test:	operation of device or system to ensure that it will perform in accordance with its intended operation or function.*
Vertical service space:	a shaft oriented essentially vertically that is provided in a building to facilitate the installation of building services including mechanical, electrical and plumbing installations and facilities such as elevators, refuse chutes and linen chutes.**

Appendix B.4

QUESTIONNAIRES

1. Apartments: For responses and analysis see Exhibit 185.
2. Hotels: For responses and analysis see Exhibit 185.
3. Ontario Chief Fire Officials: For responses and analysis see Exhibits 179 and 180.
4. Building Owners, Developers & Managers: For responses and analysis see Exhibit 187.

1. Apartments: Highrise Questionnaire

1. If you discovered a fire in the building where you presently reside, what would you do?

   ____

   ____

   ____

2. Name what fire safety devices have been provided in your highrise building.

   ____

   ____

   ____

3. When the fire alarm goes off in your building, do you (circle one):
   a) believe that there is a fire and take whatever action you believe necessary in the event of a fire,
   b) call the superintendent or a similar person to find out whether there actually is a fire,
   c) check in the hallway to see if there is any evidence of a fire, and if not, ignore the alarm,
   d) assume that it is a false alarm and ignore it.
4. Have you had many false fire alarms in your building? If so, please estimate the number of false alarms you have had in the last year: ____________
5. Of all the fire alarms set off in your building, what percentage would you say were false? ____________
6. Is the fire department automatically notified when the fire alarm is pulled?
   ____________ Yes ____________ No
7. In the event of a fire in your building, would you exit from your apartment if you smelled smoke outside of your doorway?
   ____________ Yes ____________ No

8. If there was no smoke outside of your apartment, would you attempt to evacuate the building or stay in your apartment?
_______ Attempt to evacuate (go to question 9)
_______ Stay in apartment (skip to question 10)

9. If you were to attempt to evacuate the building, what method would you use:
1) by elevator
2) by stairs
3) to balcony
4) to roof

10. If you remained in your apartment during the fire, what action would you take to reduce further danger?

____

____

____

11. Have you had any fire drills in your building? If so, please indicate how many. (If no fire drills, put 0): _______

12. Has there ever been a fire in the building where you live or in a previous high-rise that you lived in? _______ Yes _______ No

13. Please check the column marked yes or no to indicate whether your high-rise building has the following safety devices in it:

	Yes	No
Fire alarms on every floor	___	___
Fire extinguishers on every floor	___	___
Fire hoses on every floor	___	___
Sprinklers	___	___
Voice communication (P.A. system)	___	___
Smoke detectors	___	___

14. Do you think that there is a greater danger to you as a result of fire in a high-rise building (such as the one you presently live in) than in a single family dwelling such as a house? (Please circle *one* point):

much more dangerous in high-rise	somewhat more dangerous	no difference	somewhat less dangerous	much less dangerous in high-rise

15. Do you think there is a greater danger to you as a result of fire in a high-rise building than in a low-rise building (duplex, fourplex, sixplex)?

much more dangerous in high-rise	somewhat more dangerous	no difference	somewhat less dangerous	much less dangerous in high-rise

16. Would you like to have more fire safety devices installed in your building (sprinklers, voice communication, door closers, etc.)?
_______ Yes (go to question 17)
_______ No (go to question 19)

17. If "YES" in question 16: Would you be willing to have your rent increased to help defray the cost of installing fire safety devices?
_______ Yes (go to question 18)
_______ No (go to question 19)

18. If "YES" in question 17: What percentage of your rent would you be willing to have increased? ___________ %

19. Are you afraid of the possibility of fires in your building?
___________ Yes ___________ No

20. In terms of fire safety, do you feel that your building is safe to live in?
___________ Yes ___________ No

21. Do you feel that you know enough about the action you should take in the event of a fire?
___________ Yes ___________ No

22. When you first moved into your high-rise, did you receive any instruction or information on fire safety devices in your building or what procedure to follow in the event of a fire?
___________ Yes ___________ No

23. Please indicate the number of years you have lived in high-rise buildings: ___________

24. Have you received any leaflets, pamphlets or other information recently, pertaining to fire safety or highrise buildings?
___________ Yes ___________ No

BACKGROUND INFORMATION:

What floor do you live on? ___________
Age: ___________
Sex: ___________

If you have any further comments or suggestions, please feel free to write them in the space below.

2. Hotels: Highrise Questionnaire

1. If the fire alarm went off in this hotel while you were still in your room, would you (circle one):
   a) call the front desk to see whether there was a real fire and what action should be taken;
   b) exit immediately by way of the elevator;
   c) exit immediately by way of the stairs;
   d) stay in the room until help arrived;
   e) assume that it is a false alarm and ignore it.

2. If you decided to stay in your room during the course of the fire, what safety precautions would you take in your room?

____

____

____

3. Did you notice any instructions in your room on what to do in the event of a fire:
___________ Yes ___________ No (skip to question 5)

4. If yes above, did you read the information contained in the information pamphlet or notice behind the door concerning fire safety procedures?
___________ Yes ___________ No

5. Are you concerned about the risk of fires in hotels? (please circle one point)

very concerned	somewhat concerned	not sure	slightly concerned	not at all concerned

6. Do you know where the fire exits are on your floor?
__________ Yes __________ No

7. Do you feel that you know enough about the action you should take in the event of a fire?
__________ Yes __________ No

8. How often do you stay in hotels on an annual basis?
__________ times a year

9. Does your stay in hotels usually involve business or pleasure?
__________ Business __________ Pleasure

10. Please indicate your floor number: __________

11. We would welcome any other comments or suggestions you may have. Please write them on the back of this page.

3. Questionnaire for Chief Fire Official

Name of Fire Department: ____________________
Address: ____________________
____
Phone: ____________________
Chief Fire Official: ____________________

1. Do you interpret the Fire Code as requiring the owners of all highrise buildings, regardless of their date of construction, to prepare a fire safety plan as contemplated by the Fire Code?
__________ Yes __________ No

If no, could you please advise the buildings to which you believe this requirement of the Fire Code applies. (list below)

____

____

____

2. What procedure, if any, is in place in your municipality to either ensure or promote the preparation and approval of fire safety plans as contemplated by the Fire Code?

(Of particular interest is whether the fire department is playing any role in this regard.)

3. If possible, advise of the approximate number (exact number if available) of buildings in your municipality which are considered to fall within the requirement to prepare a fire safety plan as contemplated by the Fire Code.
__________ buildings

Regardless of your ability to provide information as to the number of buildings referred to in item 3 above, would you please advise of the number of plans which have been submitted and/or accepted by you as contemplated by the Ontario Fire Code.
__________ plans submitted/accepted

4. Provide any additional information relating to the filing of fire safety plans which may assist the Commission in understanding the present state of compliance with the Fire Code.

FIRE DRILLS

5. Are there any procedures established for evacuation of tenants and/or occupants during fire drills in the following highrise buildings? If yes, please describe.

a) apartment buildings Yes __________ No __________
b) office buildings Yes __________ No __________
c) institutional buildings Yes __________ No __________
d) hotels Yes __________ No __________

4. Building Owners, Developers and Managers Questionnaire on Fire Safety Plans and Fire Drills

1. Does your association interpret the Fire Code as requiring *all* highrise buildings, regardless of their date of construction, to prepare a fire safety plan as contemplated by the Fire Code?

________ ___ Yes __________ No

2. If your association interprets the Fire Code as *not* applying to all highrise buildings, to what highrise buildings does it apply? (list below)

____

____

____

3. What procedure, if any, has been put in place by your association to either ensure or promote the preparation and approval of fire safety plans by your members, as contemplated by the Ontario Fire Code?

____

____

____

4. If possible, advise us of the approximate number (exact number if available) of the buildings owned by members of your association which are considered to fall within the requirements to prepare a fire safety plan as contemplated by the Ontario Fire Code.

__________ buildings

5. Whether or not you are able to answer item 4 above, would you advise the number of fire safety plans which have been prepared and/or submitted by members of your association and the number of plans which have been accepted by the Chief Fire Official as defined in the Ontario Fire Code. (The "Chief Fire Official" includes the municipal Fire Chief in those municipalities where a fire department exists.)

__________ plans prepared/submitted
__________ plans accepted by Chief Fire Official

6. Provide any additional information relating to the filing of fire safety plans which may assist the Commission in understanding the present state pf compliance with the Ontario Fire Code.

B. FIRE DRILLS

7. Does your association have any policy with respect to the degree of participation of tenants and/or occupants during fire drills? (If yes, please describe.)

Name of Association: ____________________

Signature: ____________________

Date: ____________________

Appendix B.5

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Appendix B.6

RESULTS OF RECOMMENDATIONS OF CORONERS' JURY INN ON THE PARK INQUEST

7 May, 1981

FIRE DEPARTMENT:

1. "We recommend that all fire departments should prepare a pre-fire plan for each hotel, which includes entrances, emergency exits, fire fighting equipment, exit stairwells, and an area for a central command post to be established in an emergency."

Response:

The Inquiry was advised that pre-fire plans are being prepared for hotels by fire departments in the larger centres. Some municipalities are developing computer programs for storage and retrieval of pre-fire plans. Chapter 12 contains a more detailed discussion of pre-fire plans. My Recommendations 12.3 and 12.4 deal specifically with pre-fire plans.

2. "We further recommend that radio communications equipment be improved and upgraded in order to achieve better communications in high-rise buildings generally and especially during emergency situations. Consideration might also be given to the availability of another radio channel to be used by fire fighters in emergencies."

Response:

The Ontario Association of Fire Chiefs has made recommendations regarding radio communications to the committee which is reviewing the *Fire Departments Act*. They recommend, "that at the very least the Province undertake a study to determine the adequacy of the present level of equipment in use, and consider earmarking grants to municipalities to insure the purchase of adequate equipment in the future." My Recommendation 12.5 deals specifically with radio channels for fire departments.

3. "It is also recommended that longer duration, light-weight masks be developed for firefighting purposes and that these masks become mandatory for use in Ontario."
4. "We further recommend that light-weight and safe apparel be developed for firefighting purposes."

Response:

The Inquiry was advised that there is presently a committee formed under the *Occupational Health and Safety Act* which is looking at the issues raised in the jury's Recommendations 3 and 4. A committee formed by the

National Research Council is examining the fire service in Canada, including equipment.

5. "Also, sufficient resuscitators should be taken into high-rise buildings when conducting search and rescue, in order to meet the immediate needs of the situation."

Response:

The Inquiry was advised that the use of resuscitators for search and rescue in any particular circumstance is a command decision. At the fire scene, the officer in charge must decide whether to initially do firefighting or in the alternative, to conduct search and rescue. The Inquiry was also advised that there is a resuscitator in every fire vehicle and that the ambulances which arrive will also have resuscitators.

6. "We further recommend that firefighting personnel be efficiently deployed in order to ensure that search and rescue is commenced as soon as possible after arrival."

Response:

The Inquiry was advised that the deployment of firefighting personnel is a general command decision which varies from situation to situation.

7. "We also recommend that all casualties be removed from contaminated areas immediately."

Response:

The Inquiry was advised that this is a standard firefighting procedure at the present time.

REGULATORY AGENCIES:

1. "We recommend that the Ontario Fire Code be enacted immediately and that it include provisions for upgrading present buildings where feasible and that the Code include our recommendations for hotel fire safety as stated hereinafter. We further recommend that this Code be revised on an ongoing basis."

Response:

The Ontario Fire Code was filed as Ontario Regulation 730/81. The issue of upgrading fire safety in existing buildings is being dealt with by the Part 9 Retrofit Task Group. In the case of hotels, proposed amendments to the *Hotel Fire Safety Act* include retrofit requirements. Retrofit is the subject matter of Chapter 10.

In terms of the OFC being revised on an ongoing basis, Roy Philippe advised the Inquiry that the OFM has a file of suggestions and comments relating to the OFC which are reviewed to assess the need for amendment. My Recommendation 2.3 deals with the regular re-publication of the Ontario Fire Code.

2. "We recommend that the Ontario Fire Marshal's Office be designated as the sole agency for all fire safety inspections and all fire safety training in the Province. This Agency should establish a specially trained unit for fire safety inspections in high-rises."

Response:

Chapters 2 and 12 discuss the legislation which governs fire safety inspections. Chapter 12 deals specifically with the training of the fire service. The Office of the Fire Marshal is now responsible for fire safety in all hotels regulated by the *Hotel Fire Safety Act*.

3. "We recommend that the Government of Ontario licence and certify all fire alarm personnel and companies which carry out tests of fire alarms."

Response:

This matter, and the licencing of other trades, is dealt with in Chapter 13. My Recommendation 13.9 deals with the licencing of persons that verify and maintain fire alarm systems.

4. "We further recommend that the Ontario Fire Marshal's Office should devise an approved fire alarm test procedure and maintenance plan which includes periodic testing of the entire system in all highrise buildings and hotels, tests the back-up system, and all bells, and alarm initiation devices, etc."

Response:

The owners of all highrise buildings are now required by the Ontario Fire Code to maintain and test fire alarm systems in accordance with recognized standards. Chapter 8 contains a discussion of fire alarm systems, including standards for their installation, testing, and maintenance. The *Hotel Fire Safety Act* is being amended to have similar provisions. My Recommendation 8.1 suggests a one time testing of all fire alarms that have not been verified using an acceptable standard.

5. "We recommend the community colleges, in conjunction with the Ontario Fire Marshal's Office and local fire departments develop and implement an approved fire safety course including evacuation procedures, for hotel employees throughout Ontario and that a designated number of employees be required to attend. We also recommend that fire safety procedures be included in the curriculum of hotel/motel management courses."

Response:

Training courses in fire safety have been developed for hotel employees through the Office of the Fire Marshal. These courses are being conducted at the present time and include instruction on the subject of evacuation procedures.

In terms of the recommendation that a designated number of employees be *required* to attend these courses, John Hess testified that he preferred to have these courses attended on a voluntary basis until such time as it appears that there is not an acceptable response to the courses. Evidence to this point is that there is a good response to these courses. This course, and the issue of designation of fire safety specialists in hotels, are discussed in detail in Chapter 4.

6. "We recommend that the Ontario Fire Marshal's Office review and approve emergency procedure and evacuation plans for all hotels."

Response:

The review and approval of emergency procedures and evacuation plans for all hotels is being done at the present time by provincial inspectors under the

Hotel Fire Safety Act. Chapter 4 contains a more detailed discussion regarding this matter.

HOTEL RECOMMENDATIONS:

1. "We recommend that the fire department be notified immediately upon activation of the fire alarm."

Response:

The instruction to notify the fire department immediately upon activation of the fire alarm is part of the training program offered to hotel employees by the Office of the Fire Marshal. Failure to notify the fire department is an offence under the *Hotel Fire Safety Act*.

2. "We recommend that all hotels be wired to a central alarm agency where feasible.

Response:

My Recommendation 3.3 suggests direct connections for all highrise buildings unless the owner can provide 24 hour per day on-site supervision.

3. "We further recommend that hotel staff in conjunction with local police and fire department embark upon a program to eliminate malicious false alarms."

Response:

False alarms are discussed in Chapter 8.

4. "Under no circumstances should hotel staff silence alarms."

Response:

My Recommendation 8.3 deals with this matter. Instructions that fire alarms should not be silenced by hotel staff is included in instructions presently being offered to hotel staff by the Office of the Fire Marshal. It is an offence under the *Hotel Fire Safety Act* to silence a fire alarm under certain circumstances.

5. "Hotels of a certain capacity be required to have a person/s designated as a fire safety officer within the hotel. Such person to wear suitable identification, e.g. a badge. All hotel employees should be required to wear identification badges."

Response:

Section 19(y) of the HFSA empowers the Lieutenant Governor in Council to pass a regulation requiring the designation of fire safety officers as contemplated by this recommendation. Mr. Hess advised the Inquiry that a regulation has not been passed at this time because he wishes to have these safety officers appointed by the hotels on a voluntary basis. He testified that at the present time these appointments are being made voluntarily and that courses designed by the OFM for these "specialists" in highrise hotels have commenced.

In relation to the suitable identification of hotel employees, the course offered to hotel staff discusses the need to establish names or titles for responsible staff and to have them identified appropriately.

6. "We recommend that the hotel maintain an up-to-date simplified plan with pertinent details for use in emergencies and that all revisions thereto be communicated to the local fire department. We further recommend that the designated fire safety officer meet the fire department on arrival, communicate location of fire, provide guest list, all available master keys, the simplified plan and provide information re: exits, etc."

Response:

All of the subjects referred to in this recommendation should be dealt with in the fire safety plan which all hotels must prepare and have approved by the hotel inspector from the Office of the Fire Marshal. The inspector responsible for each hotel is instructed by Mr. Hess to liase with the local fire departments, and discuss the results of their hotel inspections.

7. "Hotels should be required to provide guests upon registration, a set of procedures to be followed in case of fire and upon activation of the fire alarm system. We further recommend that hotel staff who accompany guests to their rooms inform them of the fire exits and emergency information on the back of the door and the aforementioned procedures."

Response:

For a discussion of public education, including the education of hotel guests, reference should be made to Chapter 13. Chapter 4 also deals with information for hotels guests, including the preparation of a pamphlet prepared by the Office of the Fire Marshal (Exhibit 292).

8. "All hotels should be required to prepare a check list containing every room in the hotel including storage and maintenance rooms and provide same to the fire safety inspector."

Response:

The Inquiry was advised that the Hotel Fire Safety Services Unit requires each hotel inspector, in the initial inspection of a hotel, to prepare drawings of the hotel which clearly identify all areas, including storage and maintenance rooms.

9. "Fire safety information to be posted in guest rooms should be on a recognizable sign, easily legible, exclusively relating to emergency procedures and should include the following information:

a) call fire department"

Response:

Hotel Fire Safety Services Unit has prepared signs for the back of hotel suite doors. They believe that the responsibility to call the fire department should fall on the hotel keeper, and that having individual hotel guests call the fire department could jam hotel switchboards.

9. b) "location of nearest exit
c) location of second exit"

Response:

The *Hotel Fire Safety Act* requires that information be placed in hotel rooms to indicate the location of the exits, where, in the discretion of an inspector, such information is necessary. The Inquiry was advised that in a hotel where there would be little confusion regarding the location of the exits, such information was not needed.

9. d) "instructions on what to do in the event one encounters smoke or fire when leaving, e.g., use alternative exit and if alternative exit cannot be reached, return to room and precautions to take to prevent smoke entering room.
   e) guests should be warned that in case of fire they may have to choose between evacuation or remaining in their rooms and using wet towels to seal cracks, vents. etc.
   f) emphasis should be placed on following the instructions of the firefighters on duty.
   g) the wording on such signs must be approved by the Ontario Fire Marshal's Office."

Response:

These recommendations are implemented by the Hotel Fire Safety Services Unit through both the preparation of signs to be posted on inside of entrance doors to hotel suites, and the development of a fire safety pamphlet to be made available to hotel keepers for distribution to guests.

10. "Exit stairwells in addition to the requirements for exit lights, should be colour coded, clearly marked as stairs as well as marked with floor numbers at each level and these stairwells should lead directly to exit doors which are clearly marked as such on both sides. Such doors are not to be blocked from view from the outside by retaining walls or other such structures, trees. etc."

Response:

No action has been taken in relation to colour-coding of stairs, but the marking of stairwell doors on both sides is now provided for in Section 30(3) of the proposed amendments to the HFSA. My Recommendation 10.4 deals with this issue.

The issue of blocking exit doors from view from the exterior of the building is, in my opinion, a matter for pre-fire plans.

11. "We recommend the following installations in hotels:
   a) sprinkler systems in all public areas, storage areas, electrical closets and service corridors."

Response:

The proposed amendments to the *Hotel Fire Safety Act* (Section 44) will require sprinklers to be retrofitted in certain areas of hotels. I have agreed with the principle of retrofitting sprinklers in hotels, and have recommended that the OBC be amended to require the installation of sprinklers in new construction of hotels as well.

11. b) "All stairwell doors should have latches in addition to door closers."

Response:

My Recommendation 10.3 deals with this issue. The proposed amendments to the *Hotel Fire Safety Act* will require all fire doors to be self-closing and positive latching.

11. c) "A fire alarm system with circuitry resistant to high temperatures."

Response:

Mr. Hess advised the Inquiry that, in his opinion, this was not a problem. He believes that the recommendation would be satisfied if the system was installed in accordance with the Electrical Code. In terms of new hotel construction, if the proposed amendments to the OBC (Exhibit 130) are passed, it will require the electrical conductors to the fire alarm system to be protected from fire to insure continued operation for a period of at least one hour.

11. d) "fire fighter communication system."

Response:

The evidence from the fire service itself indicated that two-way communication systems in highrise buildings are not used frequently during fire situations. The Inquiry was advised that firefighters rely on portable two-way communication equipment and prefer to have that system upgraded.

11. e) "pressurized stairwells, elevator shafts and service shafts."

Response:

Pressurization of the stairwells referred to in this recommendation is directed primarily to controlling the movement of smoke. Installing these systems on a retrofit basis is extremely difficult. New highrise hotels are required to have smoke control, and they are given the option of providing for smoke control in any manner which will satisfy the Chief Building Official. Sprinklers have an effect on the amount of smoke which is produced. As discussed, sprinklers have been recommended by me in certain portions of both existing hotels and new hotels. (Recommendations 4.3 and 7.5). If those recommendations are implemented, there will be additional "smoke control" in highrise hotels (if the fire takes place in a sprinklered area).

11. f) "where applicable, smoke barrier doors at elevator lobbies on each level."

Response:

Proposed change to Section 11 of the HFSA requires the installation of smoke barrier doors, the placement of which is subject to the approval of the hotel inspector.

11. g) "a public address system for emergency instructions."

Response:

In Recommendation 10.7, I have recommended that one-way voice communication be retrofitted in all hotels over 12 storeys in height.

11. h) "elevators called to main level with doors closed on activation of fire alarm."

Response:

In this report, I have recommended that in highrise buildings which do not have any means of recalling elevators in a fire emergency, such a feature must be retrofitted. I have also recommended that the OBC, which will apply to the construction of new hotels, be amended to provide for the *automatic* recall of all elevators in addition to the present requirement for manual recall. (Recommendations 8.15 and 8.16)

The OBC provides that elevator doors equipped with photo-electric eyes must close after they have been open for 10 seconds.

11. i) "automatic shut-off of ventilation system as required by regulation."

Response:

Section 42 of the HFSA Regulations requires recirculating air handling systems to shut down automatically on the sounding of a fire alarm.

11. j) "fire retardant decorating materials: furnishings, carpets, etc., in accordance with standards to be developed to limit emission of toxic gases."

Response:

The *Hotel Fire Safety Act* regulates interior finishes at the present time. For discussion relating to the regulation of furnishings, and other building contents, reference should be made to Chapter 11.

12. "Switchboard operators should have explicit instructions on what to tell guests in the event of fire."

Response:

This should be the subject matter of instruction given to hotel employees in the course offered by the Ontario Fire Marshal. The procedure to be followed by switchboard operators in fire emergencies should also be part of the hotel fire safety plan.

13. "Designated hotel staff should participate in periodic fire drills."

Response:

This is a requirement of the proposed amendments to the HFSA, and is presently part of the training course offered to hotel staff by the Ontario Fire Marshal. It is also a mandatory provision in fire safety plans for hotels.

14. "Hotel staff should be made aware of the need to retain fire safety precautionary measures when redecorating, for example when wallpapering around fire bells to ensure the paste does not interfere with the bell. Also, fire proof vacuum cleaner bags might be considered."

Response:

The general fire safety training given to hotel employees should include instruction regarding the importance of not interferring with the operation of fire alarm bells or other fire safety equipment during redecorating. This emphasizes the value of learning *reasons* for rules.

GENERAL RECOMMENDATIONS:

1. "All hotels must comply with existing building and fire safety regulations and be retrofitted with smoke or heat detectors in sleeping areas."

Response:

Section 56(2) & (3) of the proposed amendments to the HFSA Regulations deal with the retrofitting of smoke or heat detectors. Those proposed amendments *do not* make smoke detectors in the hotel suite mandatory in all cases.

In Recommendation 10.6, I have, however, recommended that all hotel suites should contain a smoke detector.

2. "All ventilation shafts should be constructed of material with the appropriate fire resistant rating, and enclosed with fire resistant material and where such shafts have penetrations these should be protected with fire resistant material as well."

Response:

Section 12 of the HFSA Regulations requires rubbish chutes, linen chutes to be retrofitted with sprinkler systems in hotels over 3 storeys.

3. "Regulatory agencies must ensure tighter control by fire safety personnel during construction of hotels and/or highrises."

Response:

For discussion of inspection during construction of hotels, and other highrises, reference should be made to Chapters 2 and 13. Plans for new hotels are reviewed by the Consulting Services Unit of the Office of the Fire Marshal for compliance with fire safety regulations.

4. "New buildings should be constructed with fire breaks on exterior walls, and/or balconies. The safety of guests or occupants should be of prime importance in the design, planning, construction, maintenance and operation of hotels and highrises. In new construction stairwells should not be adjacent to the elevator shafts."

Response:

I do not understand what is meant by "fire breaks on exterior walls" and therefore cannot advise whether this matter was discussed during the Inquiry.

In relation to the recommendation regarding new construction of stairwells not being adjacent to the elevator shaft, this is an area which should be studied along with other matters related to egress, as I have recommended in this report (Recommendation 15.23). Mr. Jake Pauls, a leading expert on the movement of people and egress facilities, indicated that the location of stairwells remote from elevator shafts may *not* be the most appropriate location for exit stairwells, and could form the subject matter of research.

5. "All building renovations and/or changes in original construction must be approved by the appropriate agency or agencies, and must be constructed with the appropriate fire resistant materials."

Response:

Building renovations and original construction usually constitute "the work of construction" as defined in the OBC. In those circumstances, a building permit is required and the construction would be inspected by the local building official.

6. "The provincial and/or federal government should encourage research in fire safety protection."

Response:

This report contains numerous recommendations which, if implemented, will necessitate research in fire safety protection.

7. **"Hotels and other highrise buildings must not erect walls or other structures which would prevent access to an exit stairwell from a corridor."**

Response:

Code provisions regarding exit stairwells prohibit obstructing access to them.

PART C: COLLECTION OF RECOMMENDATIONS

Chapter 1

1.1 The definition of highrise buildings contained in Sentence 3.2.6.1(1) of the Ontario Building Code should be retained. However consideration should be given by building code authorities to eliminating the references to "between grade and floor level" and "above grade".

1.2 Agencies which keep fire records should use the same definition of "highrise buildings".

1.3 The Office of the Fire Marshal should maintain a catalogue of all highrise buildings in Ontario.

1.4 Fire Occurrence Reports should include a description of the exact location of and the condition of the sprinkler system and information describing the proximity of sprinklers to the area of fire origin.

1.5 Fire Occurrence Reports should include, along with the age and condition of the affected building, a rough categorization of the building code under which it was constructed.

1.6 The Office of the Fire Marshal with the cooperation of the Chief Fire Officials should assist in collecting data for further study of human behaviour in fire occurrences for the purpose of testing assumptions made about human behaviour.

1.7 Owners and occupants of highrise buildings as part of a 3 year test program should be required to report to the local fire department all fires that cause more than $500 damage, if not reported as presently required by an insurer or a Fire Department, together with the causes of the fire, if known, and the method of suppression.

1.8 The Ontario Fire Marshal should collaborate fully with other Canadian Fire Marshals and Fire Commissioners in the implementation of a national fire statistical system, and process the data promptly for use while current.

Chapter 2

2.1 The Ontario Building Code should be republished every five years to match the National Building Code publication cycle.

2.2 The Province of Ontario should adopt the proposed amendments to the Ontario Building Code (Exhibit 130) expeditiously with the few exceptions referred to herein.*

2.3 The Ontario Fire Code should be republished every five years to match the National Fire Code publication cycle.

2.4 The government of Ontario should expeditiously complete the task of consolidating all legislation respecting the construction or demolition of buildings into the Ontario Building Code, and all legislation respecting fire safety standards for buildings and other structures and premises into the Ontario Fire Code.

*The amendments to the OBC were filed with the Regulations Committee on September 16, 1983 as Regulation 583/83.

2.5 Retrofitting of existing buildings for life and fire safety should be governed by provincial legislation only.

2.6 Until Part 9 of the Ontario Fire Code, which will contain the retrofit regulations, is in effect, Section 18(2) of the *Fire Marshals Act* should be used to order necessary fire and life safety installations by way of retrofit.

2.7 Upon the enactment of Part 9 of the Ontario Fire Code, Section 18(2) of the *Fire Marshals Act* should be amended to restrict its use to emergency situations only.

2.8 Increased funding should be provided to ensure proper inspection by Ontario Building Code and Ontario Fire Code inspectors of all highrise buildings.

2.9 The *Building Code Act* should be amended so that the inspector's power under Section 10 is clearly restricted to unsafe conditions of a structural nature, and that orders may be made in relation to vacant buildings and to all buildings regardless of their date of construction.

2.10 All interior finish products installed in a building which are required to have a flame-spread rating or a smoke developed classification should bear an identifying mark or symbol confirming that the product has the required rating or classification.

2.11 The Ontario Fire Code should be more actively enforced, and the courts should impose substantially increased penalties for breaches of the Ontario Fire Code and upon convictions for *Criminal Code* offences involving fire safety matters.

2.12 Chief Fire Officials should be required to maintain a record of convictions and fines for breaches of the Ontario Fire Code, and should advise the media, and particularly relevant trade and industry publications, of such convictions and fines.

2.13 Section 24(4) of the *Building Code Act* should be amended to provide that the limitation period contained therein will run not from the time of the actual breach, but from the date the breach is discovered.

2.14 There should be a Standing Advisory Committee on the Ontario Building Code.

2.15 There should be user representation on code development committees where there is an appropriate organization that represents a cross-section of user opinion.

2.16 The Building Code Commission and the Fire Code Commission should be separate bodies, but have some joint membership.

Chapter 3

3.1 Every highrise building should have full-time, on-site supervisory staff.

3.2 Where the local fire department assumes the responsibility of supervisory staff, the costs incurred by the municipalities should be recoverable from the building owner.

3.3 If any highrise building does not have in-house staff present on a twenty-four hour per day basis, the fire alarm system should be provided with a direct connection to the local fire department, or to a central station, on a retrofit basis.

3.4 *All* exemptions from the provisions of Subsection 3.2.6 of the Ontario Building Code granted for apartment buildings should be eliminated.

Chapter 4

4.1 The *Hotel Fire Safety Act* should continue as a separate Act regarding fire safety, but should be consolidated with the Ontario Fire Code when Part 9 of the Ontario Fire Code contains retrofit provisions regarding hotels.

4.2 The Ontario Building Code should be the only legislation governing construction of hotels and Section 3 of the *Hotel Fire Safety Act* should be amended accordingly.

4.3 The proposed amendments to the *Hotel Fire Safety Act* should be made with the few exceptions referred to herein.

4.4 The proposed amendment of the definition of "hotel" should be enacted.

4.5 The *Hotel Fire Safety Act* should be amended to permit the Fire Marshal in conjunction with the Chief Building Official, to order the relocation or removal of manual pull stations where, in their discretion, such action is necessary to deal adequately with any high incidence of false alarms in a hotel.

Chapter 7

7.1 The exemption granted for apartment buildings in Sentence 3.2.6.2(10) of the Ontario Building Code from the requirement to have smoke controlled between floors and in exit stairwells should be removed.

7.2 The Ontario Building Code should identify smoke control measures that have a high degree of reliability for specific types of typical highrise buildings.

7.3 The Ontario Building Code should accept the use of exterior balconies at any height as an alternative to providing smoke control. Clause 3.2.6.2(8)(a) of the Ontario Building Code, setting out a height restriction of 120 feet in regard to the use of balconies as an alternative to providing smoke control should be deleted.

7.4 A determination should be made of the acceptability of enclosed balconies as "exterior balconies" for the purposes of Ontario Building Code Clause 3.2.6.2(8)(a).

7.5 The Ontario Building Code should require all highrise buildings to be sprinklered throughout except for the residential areas (including halls and corridors) of Group C occupancy buildings, and office or mercantile spaces in those Group C occupancy buildings where the floor area of those spaces is divided into fire compartments not exceeding a specified size. The area chosen should not exceed 7500 square feet.

7.6 The Ontario Building Code should be amended to provide that control valves for sprinkler systems should be equipped with a supervisory signal system with a direct connection to the fire department.

Chapter 8

8.1 In highrise buildings, all existing fire alarm systems that have not been verified under CAN 4-S537-82, its predecessor or an acceptable manufacturer's installation test, should be subject to a one time test pursuant to CAN 4-S536-82, Parts 1, 2 and 3.

8.2 The appropriate code committee should consider amending the Ontario Building Code to provide that where a two-stage alarm is required, a general evacuation signal must sound in the initiated fire zone and a general alert throughout the remainder of the building.

8.3 Once activated, a fire alarm should not be turned off except by the Fire Department, or with their authorization.

8.4 The appropriate code committee should consider amending the Ontario Building Code to require that the activation of the trouble signal on the fire alarm control panel will cause a signal at or near the central alarm and control facility.

8.5 The meaning of the various patterns of sounds (temporal patterns) made by fire alarm systems should be uniform, regardless of whether the actual sound differs.

8.6 The Ontario Building Code should be amended to permit the Chief Building Official to approve reliable alternatives to manual pull stations as a means of activating fire alarm systems in those buildings that may experience high incidence of false alarms.

8.7 The Ontario Fire Code should be amended to permit the Chief Fire Official, in conjunction with the Chief Building Official, to order the relocation or removal of manual pull stations where, in their discretion, such action is necessary to deal adequately with a high incidence of false alarms in a building.

8.8 When a conviction for causing a false alarm contrary to the Criminal Code is entered, the court should impose substantital penalties including restitution orders for the cost of the fire department's unnecessary response.

8.9 The requirements for emergency power for elevators in the Ontario Building Code and *Elevating Devices Act* should be consistent; or, in the alternative, the legislation should clearly identify which requirement prevails.

8.10 The conflict between the *Elevating Devices Act* and the Ontario Building Code regarding sprinklers in elevator machine rooms should be resolved.

8.11 The Ontario Building Code should require the installation of smoke/heat sensors at the recall level in order to route elevators to an alternate floor in case of fire at the recall level.

8.12 Any existing vent in a highrise building or any vent to be installed in a new highrise building which has as its purpose the venting of any elevator shaft at the roof level should be closed and should not open automatically upon the activation of a fire alarm. All of these elevator vents must have the capability to be opened manually by the fire department and the additional capability to be opened by use of a remote device located at ground level, but only under the control and direction of the fire department.

8.13 The benefits, limitations or the usefulness of elevator shaft vents as an aid to smoke removal should be assessed.

8.14 The Ontario Building Code and the *Elevating Devices Act* should be made consistent regarding the requirement for elevator recall in an emergency situation.

8.15 All existing highrise buildings which do not have a firefighters' elevator as contemplated by the Ontario Building Code, should be required to have at least one elevator car equipped with a key-operated switch inside the car which will allow the firefighter to use that elevator independently of other elevators and to go only to a desired floor, and a key-operated switch at ground level to recall that elevator.

8.16 The Ontario Building Code should be amended to require automatic recall of elevators in addition to the present requirement for manual recall.

8.17 Further study should be undertaken to assess the feasibility of using elevators as a means of evacuation during a fire emergency.

8.18 In a building which is required to have emergency power for the elevators, the initial licence for the operation of an elevator should not be granted until the Director of the Elevating Devices Branch receives satisfactory proof that the emergency power system has been tested and found in compliance with CSA 282-1977, "Emergency Power Supply for Buildings".

8.19 The Electrical Safety Code and the Ontario Building Code should be consistent with regard to the life safety devices which may be serviced by a power supply separate from the primary source of power in a highrise building.

8.20 The conflict between the Electrical Safety Code and the Ontario Building Code regarding *when* a separate electrical service can be supplied from the *same* transformer as the primary source of power to the building should be resolved.

8.21 The appropriate authorities should investigate the necessity and feasibility of amending the Electrical Safety Code to require that busways for new construction be modified so that water entering the busway system cannot cause power failure.

8.22 Ontario Hydro should assess the use of electrical conductors outside of conduit and determine whether amendments to the Electrical Safety Code are warranted.

Chapter 9

9.1 The Ontario Building Code should contain a provision for the commissioning of life safety systems for highrise buildings. The provision should list the elements considered necessary for proper commissioning, thereby creating a functional definition of the term "commissioning" similar to the manner in which "Fire Safety Plans" are described in Subsection 2.8.2 of the Ontario Fire Code.

Chapter 10

10.1 In highrise residential buildings each entrance door to a room or suite should be equipped with a self-closing device.

10.2 In highrise residential buildings all entrance doors to rooms or suites should have a 20 minute fire protection rating. However, existing 1 3/4 inch thick solid core wood doors should be acceptable, and existing solid wood frames having a minimum nominal thickness of 2 inches should be acceptable for a 20 minute door assembly.

10.3 In highrise buildings, all doors to exit stairwells should be equipped with a self-closing device and a latching device.

10.4 All highrise buildings should have clearly visible signs showing floor numbering on both sides of stairwell doors, identifying exit doors, and identifying re-entry doors where stairwell doors are locked from the inside. Signs regarding elevator use should also be installed.

10.5 In highrise residential buildings other than hotels, single station smoke alarms should be installed in each suite in accordance with the standard described in Sentence 3.2.4.7(1) of the Ontario Building Code.

10.6 In highrise hotels, single station smoke alarms of either the battery-operated or hard-wired type should be installed in each hotel room or suite.

10.7 One way voice communication should be installed in all highrise buildings. Except for institutions, this requirement should apply only to buildings more than twelve storeys in building height. In addition there should be an emergency power supply for voice communication.

10.8 All highrise buildings should have a fire alarm system.

10.9 All highrise buildings should have an emergency power supply for fire pumps and ancillary equipment, or should have a siamese connection for the standpipe and hose system.

10.10 In all highrise buildings, emergency lighting should be provided for all corridors and exits.

10.11 In all highrise buildings that have emergency generators, a manual start device for such generators should be located at grade, or near enough to grade that it will be easily accessible in an emergency situation.

10.12 The Ontario Building Code should be amended to reference CSA C282-1977.

10.13 Emergency generators which have not successfully passed the initial installation performance tests in CSA C282-1977, or an acceptable manufacturer's installation test should be subject to a one time test pursuant to the initial installation performance standard in CSA C282-1977.

10.14 Article 6.7.1.3 of the Ontario Fire Code should be amended to clearly require that the written record specified in CSA C282-1977 be maintained.

10.15 Sprinklers should be installed in all underground portions of highrise residential buildings, including the underground parking areas.

10.16 If an apartment building does not have balconies and does not otherwise comply with the requirements to control smoke contained in National Building Code Clauses 3.2.6.2(2)(3a) and (4) the corridors of the residential areas should be divided into at least two parts, with no more than one exit stairwell located in any one compartment.

10.17 The unproclaimed sections of the *Fire Marshals Act* giving inspectors the power to make orders requiring compliance with the Fire Code, and giving the persons affected by those orders various rights of appeal, should be proclaimed.

Chapter 11

11.1 Research into the means of regulating the flammability of upholstered furniture should be intensified and the resources necessary for this work should be made available.

11.2 Research into the development of a "self-extinguishing cigarette" should be intensified and the resources necessary for this work should be made available.

11.3 Education should be directed towards reducing the incidence of the careless use of smoking materials.

Chapter 12

12.1 The Province of Ontario should increase funding to the Office of the Fire Marshal to provide for additional staff, to increase its activities in education both for the public and for the fire service, and to increase its ability to investigate non-fatal, large loss fires, arson fires, and other fires of special interest.

12.2 There should be adequate fire protection for the citizens of Ontario commensurate with the needs of each municipality.

12.3 The Office of the Fire Marshal should develop a guideline for the assistance of fire departments in preparation of pre-fire plans.

12.4 Fire departments should develop pre-fire plans for all highrise buildings.

12.5 The Office of the Fire Marshal should assess the needs of local fire departments for additional radio channels, and should coordinate applications to the Federal Government for allocation of any necessary additional radio channels.

12.6 The Office of the Fire Marshal should further develop its method of monitoring advances in both technical research and firefighting procedures, and should continue to distribute the information to municipal fire department training officers.

12.7 There should be a stronger emphasis on fire prevention, as distinct from suppression, within the fire service.

Chapter 13

13.1 The Office of the Fire Marshal should develop materials to be included in courses given to building superintendents at the community colleges, emphasizing the contents of the Ontario Fire Code, the reasons for and significance of regular maintenance, and the procedures to be followed in emergencies.

13.2 The owners of highrise apartment and office buildings should intensify their efforts to make formal training available to building staff by supporting the development of courses at the community college level, and encouraging staff to attend.

13.3 The Ministry of Colleges and Universities, together with representatives of the owners of highrise apartment and office buildings and others presently involved in training of building superintendents, should set a long-range goal for training, and the ultimate certification of building supervisory staff.

13.4 The Province of Ontario, through the Building Code Branch of the Ministry of Municipal Affairs and Housing should make funds available for the implementation of training for Building Code officials at the provincial level.

13.5 Municipalities should encourage and assist building officials to take advantage of any courses for their benefit, with a view to having staff capable of being certified building officials in the future.

13.6 The Association of Professional Engineers of Ontario and the Ontario Association of Architects should encourage universities to establish fire protection courses at the university level; and such courses should deal with both technical and social aspects of building design.

13.7 All those who construct, alter or renovate buildings or install services which cause breaches in fire separations should be made aware of the extreme danger to life resulting from their failure to comply with code requirements as to fire stopping.

13.8 It should be mandatory for persons installing or maintaining sprinkler systems to be licensed.

13.9 It should be mandatory for persons who maintain or verify fire alarm systems to be licensed.

13.10 The Office of the Fire Marshal should receive sufficient funds to implement a more active public education program.

13.11 A study should be conducted to identify methods of education regarding fire safety which will result in people recalling and applying the information received in a fire emergency.

Chapter 14

14.1 There should be an increased involvement of experts in human behaviour in the code writing process, and that involvement should be formalized in a manner similar to the procedure adopted for the NFPA Life Safety Code. In addition, there should be input into the preparation of guidelines for fire safety plans and educational material by social scientists.

14.2 The fact that occupants seek information from radio and television during fires should be brought to the attention of the Canadian Association of Broadcasters and the Radio and Television News Directors Association. Members of these associations should meet with the fire service and voluntarily modify their procedures *during* fire situations in light of what is being learned about human behaviour in fires.

14.3 Present code provisions should be assessed to determine if changes could be made which would increase the benefit to the handicapped without reducing the level of safety afforded to the able-bodied.

14.4 The Ontario Fire Marshal should contact the CNIB and request that organization's involvement in the preparation of fire safety pamphlets in braille and tape recorded information.

Chapter 15

15.1 Article 2.8.2.7 of the Ontario Fire Code which requires a minimum of one copy of the fire safety plan to be permanently posted and maintained on each floor area should be amended. The section should only require the posting of emergency procedures to be used in case of fire including sounding the fire alarm, notifying the fire department, instructing occupants on procedures to be followed when the fire alarm sounds, and the procedures for evacuation of those in need of assistance.

15.2 The Ontario Fire Code should be amended to clarify the application of Article 2.8.1.1. It should unambiguously require all highrise buildings to have a fire safety plan regardless of their date of construction or whether they presently have a fire alarm system.

15.3 The Ontario Fire Code requirement that fire safety plans be prepared for all high buildings should be enforced.

15.4 Chief Fire Officials should make all reasonable efforts to ensure that the review and approval of fire safety plans which have been prepared by building owners and submitted to them for approval is given high priority.

15.5 Guidelines for the preparation of fire safety plans for all occupancies should be completed by the Office of the Fire Marshal as soon as possible, and be available for distribution to the appropriate building owners.

15.6 The Ontario Building Code should be amended to require a fire safety plan as a precondition of being granted an occupancy permit pursuant to Subsection 2.7.1 of the Ontario Building Code.

Section 18a(3) of the *Fire Marshals Act* should be amended to allow the Ontario Fire Code to require a fire safety plan for buildings under construction.

15.7 The definition of the word "occupant" in the Ontario Fire Code should be amended to refer to any person, firm or corporation which occupies the building for any purpose.

15.8 The words "major tenant" should be defined in the Ontario Fire Code, and should include any person, firm or corporation having control over any portion of the building, including the persons therein.

15.9 Clauses 2.8.2.1(1)(c) and 2.8.3.1(1)(c) of the Ontario Fire Code should not be amended, thus retaining the reference to "occupants".

15.10 A fire safety plan should include a reference to the organization of *major tenants* and the delegation of responsibility to them to carry out fire safety duties, and Sentences 2.8.2.1(1) and 2.8.3.1(1) of the Ontario Fire Code should be amended accordingly.

15.11 The Ministers and Deputy Ministers in each Ministry of the Provincial Government should be made aware of the requirements of the Ontario Fire Code, and should encourage participation by Ministry staff.

15.12 The onus should be on the building owner to include the procedure for conducting fire drills in the fire safety plan. The fire department would then deal with the procedure proposed by the owner when reviewing the fire safety plan submitted by the owner.

15.13 The Ontario Fire Code and the *Hotel Fire Safety Act* should be clarified to impose obligations on employers (major tenants) to cooperate with the owner and support efforts to conduct fire drills.

15.14 Clause 2.8.2.4(1)(a) of the Ontario Fire Code which requires the instruction of supervisory staff in the use of the voice communication system should be enforced.

15.15 A separate standard should be developed for the testing, inspection and maintenance of voice communication systems.

15.16 The written records required by the Ontario Fire Code to be kept by building owners should be requested and examined during inspections.

15.17 A standard form of record book or log book listing the *tests* required under the Ontario Fire Code, together with the frequency thereof should be provided for in the Ontario Fire Code.

15.18 The Ontario Fire Code should be amended to change the reference to non-ambulatory occupants in Sentence 2.8.2.4(1) to "those in need of assistance."

15.19 Buildings owners/managers of all highrise buildings and the handicapped occupants should ensure that a list of all handicapped occupants within the building with a description of their disability, and their location, be available for firefighters when they respond to a fire.

15.20 The locking of exit stairwell doors from the inside should be prohibited unless a building owner can convince the authority having jurisdiction that a specific floor must be secure, and that security cannot be provided by any reasonable means other than locking the exit stairwell doors.

15.21 Doors and hatches providing access to rooftops in highrise buildings should not be locked during fire emergencies.

15.22 A committee should be formed to study and make recommendations regarding the feasibility of integrating the use of helicopters into highrise fire rescue operations. Such a committee should include representatives from affected groups such as the fire service, police, military, helicopter operators and building owners.

15.23 The means of egress should be the subject matter of intensive study at the National Building Code level.

15.24 A performance standard for *filter-type* smoke masks should be developed, and in the interim the Hazardous Products Branch of the Department of Consumer and Corporate Affairs (Ottawa) should develop standard information which all manufacturers of filter-type smoke masks would be required to provide to consumers.

15.25 Escape devices for highrise buildings should be assessed by a committee composed of representatives of the Building Code Branch and the Ontario Fire Marshal.

PART D: SUMMARY IN FRENCH

INTRODUCTION

L'enquête a été constituée suivant un arrêté en conseil daté du 30 juin 1982. Le 13 septembre 1982 avait lieu une séance préliminaire au cours de laquelle nous avons tracé les grandes lignes des procédures à suivre et avons étudié les demandes d'autorisation à participer à l'enquête. Nous avons autorisé à participer toutes les personnes qui en ont fait la demande. A mon avis, "l'objet de cette enquête présentait pour eux un intérêt direct et considérable", conformément aux exigences de la *Loi sur les enquêtes publiques.* Conformément à l'article 5 de cette loi, les personnes autorisées à participer ont eu, au cours de l'enquête, "l'occasion de témoigner et de sommer et d'interroger ou de contre-interroger des témoins personnellement ou par. . .avocat au sujet de preuves pertinentes à leur intérêt." Toutes les personnes qui ne demandaient pas la participation mais qui désiraient témoigner ou prendre la parole durant l'enquête ont été averties qu'elles pouvaient le faire.

Les audiences officielles ont débuté le ler novembre 1982. Il y a eu 67 jours d'audiences y compris les observations finales qui se sont terminées le 6 juin 1983. Toute la documentation et tous les témoignages ont été réexaminés au moment de la rédaction du rapport final.

Le processus d'audience était entièrement public. Aucune audience à *huis clos* n'a été demandée, ni requise. Un effort délibéré a été fait pour fournir des renseignements et de la documentation à tous ceux qui en faisaient la demande, spécialement aux représentants des médias, qui ont assisté à un certain nombre d'audiences. Je tiens à les féliciter pour l'usage discret qu'ils ont fait de leurs appareils d'enregistrement.

Soixante-quinze personnes ont témoigné à l'enquête. Plusieurs de ces témoins étaient très compétents dans leur domaine. On peut juger de leur compétence en se référant à leur curriculum vitae contenu dans le Volume 2. Nous avons aussi reçu 93 dossiers écrits et accepté 316 pièces dont la liste se trouve dans le Volume 2. Trois documents ont été déposés après la clôture des audiences. Nous les avons inscrits comme étant les trois dernières pièces de façon à avoir une liste complète des matériaux que nous avons reçus.

Plusieurs des conclusions de l'enquête ont été fondées sur l'étude d'un certain nombre d'incendies dans les bâtiments de grande hauteur. Cette étude n'a pas eu comme seul avantage l'identification de problèmes particuliers. Grâce à l'audition de témoignages sur de réels incendies, j'ai été en mesure d'apprécier plus facilement les témoignages de plusieurs personnes qui ont traité des aspects techniques de la question.

Les recommandations contenues dans ce rapport doivent être examinées en ayant les quatre points suivants bien à l'esprit.

Premièrement, quelques-unes de ces recommandations auront peut-être été mises en vigueur avant la parution de ce rapport, ce qui est fort probable étant donné toute l'activité que l'on retrouve dans le domaine de la sécurité incendie dans les bâtiments de grande hauteur. L'enquête a revu et fait des recommandations au sujet des modifications proposées au Code du Bâtiment de l'Ontario, à la *Loi sur la sécurité-incendie dans les hôtels*, et à des articles de la *Loi sur les commissaires des incendies* qui ne sont pas encore promulguées. Les audiences ont pris fin en juin 1983, et depuis ce temps quelques-unes de ces modifications sont entrées en vigueur.

Deuxièmement, quelques recommandations s'appliquent non seulement à la sécurité incendie dans les bâtiments de grande hauteur, mais aussi à la sécurité incendie en général.

Troisièmement, ce rapport comprend de la documentation technique et scientifique au sujet de la sécurité incendie dans les bâtiments de grande hauteur. Cette documentation est incluse pour assurer une meilleure compréhension des différents problèmes. Quand cela s'avère nécessaire, quelques points techniques et scientifiques font l'objet d'une recommandation générale ou non détaillée qui peut inclure une suggestion pour une autre étude.

Enfin, il s'agissait d'une enquête provinciale. Quelques recommandations portent sur des questions que seule une loi ou action fédérale peut réglementer. Je ne crois pas qu'il soit opportun ni indiqué de faire des recommandations particulières proposant des modifications aux lois fédérales. Par contre, j'espère que le fait de signaler ces problèmes occasionnera un dialogue approprié et vigoureux entre, d'une part, le gouvernement provincial et le public, y compris les services d'incendie et, d'autre part, le gouvernement fédéral.

Ce rapport comprend quatre parties fondamentales: les chapitres 1 et 2 font état de façon détaillée des difficultés issues du mandat de l'enquête et de la législation. Les chapitres 3 à 6 contiennent une description d'un certain nombre d'incendies qui ont eu lieu dans quatre genres de bâtiments de grande hauteur: logements, hôtels, bureaux et institutions.

Du chapitre 7 au chapitre 10, il est principalement question des installations et du matériel qui se trouvent à l'intérieur des bâtiments de grande hauteur. Dans les chapitres de 11 à 15, l'accent est mis sur les aspects humains de la sécurité incendie. Bien que je reconnaisse l'importance des installations et du matériel, je crois que la compréhension de l'aspect humain demeure essentielle à l'amélioration de la protection des vies humaines.

Le lecteur trouvera dans le Volume 2 des renseignements qui lui permettront d'examiner les matériaux étudiés par l'enquête et il sera ainsi à même d'apprécier toute la portée des audiences. Nous espérons que ces renseignements aideront aussi ceux qui veulent étudier la question plus à fond.

RECUEIL DES RECOMMANDATIONS

Chapitre 1

1.1 La définition des bâtiments de grande hauteur citée au paragraphe 3.2.6.1(1) du Code du bâtiment de l'Ontario devrait être retenue. Toutefois, les responsables du Code du bâtiment devraient considérer l'élimination des mentions "entre le niveau moyen du sol et le niveau du plancher" et "au-dessus du niveau moyen du sol".

1.2 Les bureaux qui tiennent les registres des incendies devraient tous utiliser la même définition des "bâtiments de grande hauteur".

1.3 Le bureau du commissaire des incendies devrait tenir une liste de tous les bâtiments de grande hauteur situés en Ontario.

1.4 Les rapports d'incendies devraient contenir une description de la situation exacte et de l'état du réseau d'extincteurs automatiques à eau, ainsi que des informations décrivant la proximité des extincteurs de l'origine de l'incendie.

1.5 Les rapports d'incendie devraient contenir l'âge et l'état du bâtiment dont il est question ainsi qu'un classement sommaire selon les catégories du Code du bâtiment en vigueur au moment de sa construction.

1.6 Le bureau du commissaire des incendies, avec la collaboration des responsables des services d'incendie devrait aider à recueillir des informations pour une étude plus poussée du comportement humain lors d'un incendie et ce, dans le but de vérifier les hypothèses émises à ce sujet.

1.7 En accord avec un programme pilote de 3 ans, les propriétaires et locataires de bâtiments de grande hauteur devraient être obligés d'aviser le service d'incendie local de tous les incendies causant plus de $500.00 de dommages, en décrivant si possible les causes et la méthode d'extinction de l'incendie, s'ils n'ont pas été rapportés par un assureur ou un employé du Service d'incendie tel qu'exigé actuellement.

1.8 Le commissaire des incendies de l'Ontario devrait offrir son entière collaboration à d'autres commissaires et enquêteurs des incendies du Canada afin qu'ils réalisent ensemble un programme national de statistiques des incendies. Il devrait traiter les données rapidement afin qu'elles puissent être utilisées alors qu'elles sont encore actuelles.

Chapitre 2

2.1 Le Code du bâtiment de l'Ontario devrait être réédité suivant le cycle de publication du Code national du bâtiment, soit tous les cinq ans.

2.2 La province de l'Ontario devrait adopter de façon expéditive les modifications proposées au Code du bâtiment de l'Ontario (Pièce 130), avec les quelques exceptions mentionnées.

2.3 Le Code de prévention des incendies de l'Ontario devrait être réédité suivant le cycle de publication du Code national de prévention des incendies, soit tous les cinq ans.

2.4 Le gouvernement de l'Ontario devrait de façon expéditive, compléter la tâche de refonte dans le Code du bâtiment de l'Ontario de toutes les lois concernant la construction et la démolition des bâtiments, ainsi que la refonte dans le Code de prévention des incendies de l'Ontario de toutes les lois concernant les normes de sécurité incendie pour les bâtiments et autres édifices et locaux.

2.5 La modification des bâtiments en vue de la sécurité incendie et la protection des personnes devrait être du ressort de la législation provinciale seulement.

2.6 Jusqu'au moment où entrera en vigueur la partie 9 du Code de prévention des incendies de l'Ontario qui contiendra les réglements ayant trait à la modification, on devrait avoir recours à l'article 18(2) de la *Loi sur les commissaires des incendies* pour ordonner des installations nécessaires à la protection des personnes et la prévention des incendies par voie de modification.

*Les modifications au Code du bâtiment de l'Ontario ont été déposées auprès du comité sur les règlements le 16 septembre 1983, et portent le numéro Règlement 583/83.

2.7 Quand la partie 9 du Code de prévention des incendies de l'Ontario sera promulguée, l'article 18(2) de la *Loi sur les commissaires des incendies* devrait être modifié de façon à limiter son utilisation aux cas d'urgence seulement.

2.8 Il devrait y avoir plus de fonds disponibles pour que tous les bâtiments de grande hauteur puissent être inspectés par les inspecteurs du Code du bâtiment de l'Ontario et du Code de prévention des incendies de l'Ontario.

2.9 La *Loi sur le Code du bâtiment* devrait être modifiée pour qu'à l'article 10 il soit établi que le pouvoir de l'inspecteur se limite clairement aux conditions dangereuses des structures. La loi devrait aussi prévoir l'émission d'ordonnances au sujet des bâtiments inoccupés et de tous les bâtiments sans distinction quant à la date de leur construction.

2.10 Dans un bâtiment, tous les produits de revêtement intérieur de finition qui doivent avoir un indice de propagation de la flamme ou un indice de dégagement des fumées, devraient porter une marque ou un symbole d'identification qui confirme que le produit porte l'indice exigé.

2.11 Il faudrait faire respecter plus rigoureusement le Code de prévention des incendies de l'Ontario, et les tribunaux devraient imposer des peines considérablement plus élevées pour les infractions au Code de prévention des incendies de l'Ontario et pour les condamnations pour des infractions au *Code criminel* qui touchent à des questions de sécurité incendie.

2.12 Les responsables des services d'incendie devraient être obligés de tenir une liste des condamnations et des amendes pour infractions au Code de prévention des incendies de l'Ontario, et ils devraient avertir les représentants des médias et des publications industrielles pertinentes de ce genre de condamnations et d'amendes.

2.13 L'article 24(4) de la *Loi sur le Code du bâtiment* devrait être modifié afin de stipuler que le délai de prescription qu'il contient ne débute pas au moment où l'infraction est commise mais plutôt à la date à laquelle elle est découverte.

2.14 Un comité consultatif permanent sur le Code du bâtiment de l'Ontario devrait être formé.

2.15 Il devrait y avoir représentation des usagers dans les comités sur l'élaboration du Code là où il y a une organisation appropriée qui représente un échantillon des opinions des usagers.

2.16 La Commission sur le code du bâtiment et la Commission sur le code de prévention des incendies devraient constituer deux entités séparées, mais elles devraient avoir quelques membres conjoints.

Chapitre 3

3.1 Du personnel de surveillance devrait être présent en permanence sur les lieux dans tous les bâtiments de grande hauteur.

3.2 Là où le service public des incendies assume la responsabilité de personnel de surveillance, les frais encourus par les municipalités devraient être remboursés par le propriétaire du bâtiment.

3.3 Dans tout bâtiment de grande hauteur où il n'y a pas de personnel de surveillance sur les lieux vingt-quatre heures par jour, le réseau avertisseur d'incendie devrait être muni d'une ligne de communication directe avec le service d'incendie local, par voie de modification, ou avec le poste central.

3.4 Il ne devrait plus y avoir d'exemptions accordées aux dispositions du paragraphe 3.2.6 du Code du bâtiment de l'Ontario pour des bâtiments à logements.

Chapitre 4

4.1 La *Loi sur la sécurité incendie dans les hôtels* devrait demeurer une loi distincte en ce qui concerne la sécurité incendie mais devrait être refondue avec le Code de prévention ds incendies de l'Ontario lorsque la Partie 9 de ce code contiendra des dispositions au sujet des modifications faites dans les hôtels.

4.2 Le Code du bâtiment de l'Ontario devrait être la seule législation réglementant la construction d'hôtels et l'article 3 de la *Loi sur la sécurité incendie dans les hôtels* devrait être modifié en conséquence.

4.3 Les modifications proposées à la *Loi sur la sécurité incendie dans les hôtels* devraient être entérinées avec les quelques réserves dont il est fait mention dans ce chapitre.

4.4 La modification proposée pour la définition d' "hôtel" devrait être approuvée.

4.5 La *Loi sur la sécurité-incendie dans les hôtels* devrait être modifiée de façon à permettre au commissaire des incendies, conjointement avec le chef du service du bâtiment, de demander qu'un avertisseur manuel d'incendie soit déplacé ou retiré là où, selon eux, il est nécessaire de faire ce changement pour remédier adéquatement à un problème de fréquence élevée des fausses alertes dans un hôtel.

Chapitre 7

7.1 L'exemption accordée pour les bâtiments à logements contenue au paragraphe 3.2.6.2(8) (a) du Code du bâtiment de l'Ontario, qui stipule qu'il n'est pas nécessaire de contenir la fumée entre les étages et dans les cages d'escalier d'issue, devrait être retirée.

7.2 Le Code du bâtiment de l'Ontario devrait préciser les mesures de contrôle des fumées qui sont d'une grande fiabilité pour des genres typiques de bâtiments de grande hauteur.

7.3 Le Code du bâtiment de l'Ontario devrait permettre l'usage de balcons extérieurs à n'importe quelle hauteur comme solution de rechange à un système de contrôle des fumées. Le paragraphe 3.2.6.2(8) (a) du Code du bâtiment de l'Ontario qui limite aux bâtiments de moins de 120 pieds de hauteur l'utilisation de balcons extérieurs comme solution de rechange à un système de contrôle des fumées devrait être rayé.

7.4 Une décision devrait être prise au sujet de l'acceptation de balcons cloisonnés comme "des balcons extérieurs" pour les fins du paragraphe 3.2.6.2(8) (a) du Code du bâtiment de l'Ontario.

7.5 Le Code du bâtiment de l'Ontario devrait stipuler que tous les bâtiments de grande hauteur doivent être entièrement protégés par des extincteurs automatiques à eau sauf pour les aires résidentielles (y compris les vestibules et les corridors) des bâtiments à usage classifié dans le groupe C. Il en va de même pour les bureaux ou espaces commerciaux dans les bâtiments d'usage classifié dans le groupe C où l'aire de plancher est divisée en compartiments résistants au feu ne dépassant pas une grandeur donnée. L'aire choisie ne devrait pas dépasser 7500 pieds carrés.

7.6 Le Code du bâtiment de l'Ontario devrait être modifié de façon à stipuler que les robinets d'arrêt des réseaux d'extincteurs automatiques à eau doivent être équipés d'un dispositif de signal de dérangement relié au service d'incendie.

Chapitre 8

8.1 Dans les bâtiments de grande hauteur, tous les réseaux avertisseurs d'incendie en usage qui n'ont pas été vérifiés conformément à la norme CAN 4-S537-82, son prédécesseur ou un autre test d'installation du manufacturier, devraient subir un seul et unique test en conformité avec les parties 1, 2 et 3 de la norme CAN 4-S537-82.

8.2 Le Comité sur les codes pertinent devrait songer à modifier le Code du bâtiment de l'Ontario, afin qu'il y soit stipulé que, là où est exigé un avertisseur à double signal, un signal d'évacuation générale doit retentir dans la zone où le feu a commencé et un signal d'alerte générale doit retentir dans tout le reste du bâtiment.

8.3 Seul un employé du service d'incendie, ou quelqu'un ayant reçu l'autorisation d'un de ces employés, devrait arrêter un avertisseur d'incendie une fois déclenché.

8.4 Le Comité sur les codes pertinent devrait songer à modifier le Code du bâtiment de l'Ontario afin qu'il soit exigé que le déclenchement du signal d'alarme sur le tableau de commande de l'avertisseur d'incendie envoie un signal au poste central d'alarme et de commande.

8.5 Le sens des différentes variations du son (variations temporelles) que rendent les réseaux avertisseurs d'incendie devrait être uniforme même si en réalité ce son est différent.

8.6 Le Code du bâtiment de l'Ontario devrait être modifié afin de permettre au chef du service du bâtiment d'approuver les solutions apportées pour remplacer les avertisseurs manuels comme moyen de déclencher les réseaux avertisseurs d'incendie dans les bâtiments oû il y aurait un nombre élevé de fausses alertes.

8.7 Le Code de prévention des incendies de l'Ontario devrait être modifié pour permettre au responsable en chef du service d'incendie de concert avec le chef du service du bâtiment d'ordonner l'installation d'avertisseurs d'incendie manuels, lorsqu'ils considèrent qu'un tel changement est nécessaire pour remédier adéquatement à un problème de fréquence élevée de fausses alertes dans un bâtiment.

8.8 Quand une condamnation pour le déclenchement d'une fausse alerte contrairement au Code criminel est inscrite, le tribunal devrait imposer des peines sévères qui comprendraient des ordonnances de restitution pour les frais occasionnés par la sortie inutile du service d'incendie.

8.9 Il devait y avoir concordance entre les exigences du Code du bâtiment de l'Ontario et celles de la *Loi sur les appareils de levage* au sujet de l'alimentation électrique de secours pour les ascenseurs; ou, le cas échéant, il devrait être clairement indiqué dans la législation quelles exigences prévalent.

8.10 Le problème de concordance entre le Code du bâtiment et la *Loi sur les appareils de levage* au sujet des extincteurs automatiques à eau dans les constructions hors toit abritant la machinerie d'ascenseur devrait être résolu.

8.11 L'installations de détecteurs de fumée et de chaleur au niveau de correspondance devrait être exigée dans le Code du bâtiment de l'Ontario afin que les ascenseurs soient envoyés à un autre étage en cas de feu au niveau de correspondance.

8.12 Tout orifice de ventilation déjà existant dans un bâtiment de grande hauteur, ou tout orifice de ventilation à être installé dans un nouveau bâtiment de grande hauteur, qui sert à la ventilation de n'importe quelle gaine d'ascenseur au niveau du toit devrait être fermée et ne devrait pas s'ouvrir automatiquement à la suite du déclenchement d'un avertisseur d'incendie. Tous les orifices de ventilation dans ces ascenseurs doivent s'ouvrir manuellement ou à l'aide d'une commande à distance située au sol. Cependant seul un pompier doit pouvoir les ouvrir ou donner l'ordre de les ouvrir, que ce soit à la main ou à distance.

8.13 Les avantages, les limites et l'utilité des orifices de ventilation des gaines d'ascenseur comme moyen d'aider à l'écoulement de l'air enfumé devraient être étudiés.

8.14 Il faudrait faire concorder le Code du bâtiment de l'Ontario et la *Loi sur les appareils de levage* en ce qui a trait aux exigences pour le rappel de l'ascenseur en cas d'urgence.

8.15 Il devrait être exigé que tous les bâtiments de grande hauteur qui n'ont pas d'ascenseur à l'usage des pompiers tel que proposé dans le Code du bâtiment de l'Ontario aient au moins un ascenseur muni d'un interrupteur à clé situé à l'intérieur de la cabine d'ascenseur afin de permettre aux pompiers d'utiliser cet ascenseur indépendamment des autres ascenseurs et sans tenir compte des appels des étages. Il devrait aussi y avoir un interrupteur à clé au niveau du sol pour rappeler cet ascenseur.

8.16 Le Code du bâtiment de l'Ontario devrait être modifié afin d'exiger la présence d'un appareil automatique de rappel des ascenseurs, en plus de la présente exigence d'un rappel manuel.

8.17 Une étude devrait être menée pour évaluer la possibilité d'utiliser les ascenseurs comme moyen d'évacuation en cas d'incendie.

8.18 Dans un bâtiment où il doit y avoir une source d'alimentation électrique de secours pour les ascenseurs, le permis initial de mise en service pour les ascenseurs ne devrait pas être accordé avant qu'il n'ait été prouvé de façon satisfaisante au directeur de la *Division des appareils de levage* que la source d'alimentation a été vérifiée et qu'elle répond à toutes les exigences de la norme ACNOR 282-1977, "Source d'alimentation électrique de secours pour les bâtiments".

8.19 Il devrait y avoir concordance entre le Code de sécurité sur l'électricité et le Code du bâtiment de l'Ontario en ce qui a trait à l'alimentation des dispositifs de protection des personnes à une source électrique autre que de la source d'alimentation électrique première dans un bâtiment de grande hauteur.

8.20 Il faudrait faire concorder le Code de sécurité sur l'électricité et le Code du bâtiment de l'Ontario en ce qui concerne la question suivante: *quand* un service électrique indépendant peut-il être alimenté par le *même* transformateur que la source d'électricité première du bâtiment.

8.21 Les autorités compétentes devraient étudier s'il est nécessaire et s'il est possible de modifier le Code de sécurité sur l'électricité afin d'exiger que les boîtes de répartition pour les nouvelles constructions soient modifiées de sorte qu'une pénétration d'eau à l'intérieur de la boîte de répartition n'occasionne ni ne puisse occasioner de panne de courant.

8.22 L'Hydro Ontario devrait étudier l'utilisation de câblage électrique à l'extérieur du tube et déterminer si des modifications au Code de sécurité sur l'électricité sont justifiées.

Chapitre 9

9.1 Le Code du bâtiment de l'Ontario devrait contenir une disposition au sujet de la "mise en service" des dispositifs de protection des personnes dans les bâtiments de grande hauteur. La disposition devrait contenir une liste des éléments considérés nécessaires à la "mise en service" et de ce fait créer une définition fonctionnelle de ce terme suivant la méthode employée pour décrire les "plans de sécurité incendie" à la sous-section 2.8.2 du Code de prévention des incendies de l'Ontario.

Chapitre 10

10.1 Dans les bâtiments d'habitation de grande hauteur, chaque porte donnant dans une pièce ou une suite devrait être munie d'un dispositif de fermeture automatique.

10.2 Dans les bâtiments d'habitation de grande hauteur, toutes les portes ouvrant sur une pièce ou une suite devraient avoir un degré pare-flammes de 20 minutes. Toutefois, les portes en bois massif d'une épaisseur d'un pouce et trois quarts devraient être acceptables et les encadrements en bois massif qui ont au moins deux pouces d'épaisseur devraient être acceptables pour une porte de ce type.

10.3 Toutes les portes d'issue des cages d'escalier des bâtiments de grande hauteur devraient être munies d'un dispositif de fermeture automatique et d'un loquet.

10.4 Dans tous les bâtiments de grande hauteur, il devrait y avoir des panneaux indiquant le numéro des étages de chaque côté des portes de cages d'escalier, des panneaux indiquant les portes d'issue et identifiant les portes pour entrer dans le bâtiment là où les portes des cages d'escalier sont verrouillées de l'intérieur. Des panneaux expliquant le mode d'utilisation des ascenseurs devraient aussi être installés.

10.5 Dans les bâtiments d'habitation de grande hauteur autres que les hôtels, des avertisseurs de fumée indépendants devraient être installés dans chaque suite, conformément à la norme prescrite au paragraphe 3.2.4.7(1) du Code du bâtiment de l'Ontario.

10.6 Dans les hôtels de grande hauteur, des avertisseurs indépendants, soit à piles ou branchés directement à la source d'alimentation électrique, devraient être installés dans chaque chambre ou suite.

10.7 Un réseau de communication phonique à sens unique devrait être installé dans tous les bâtiments de grande hauteur. Sauf pour les institutions, cette exigence ne devrait s'appliquer qu'aux bâtiments de plus de douze étages de hauteur de bâtiment. Il devrait aussi y avoir une source d'alimentation électrique de secours qui, au besoin, alimenterait le réseau de communication phonique.

10.8 Il devrait y avoir un réseau avertisseur d'incendie dans tous les bâtiments de grande hauteur.

10.9 Dans tous les bâtiments de grande hauteur, il devrait y avoir une source d'alimentation électrique de secours pour les pompes à incendie et l'équipement auxiliaire. Si ce n'est pas le cas, il devrait y avoir un raccord-pompier pour le réseau de canalisation et de robinets armés d'incendie.

10.10 Dans tous les bâtiments de grande hauteur, il devrait y avoir de l'éclairage de sécurité dans tous les corridors et dans toutes les issues.

10.11 Dans tous les bâtiments de grande hauteur où il y a des génératrices de sécurité, il devrait y avoir un dispositif de mise en marche manuel situé au niveau moyen du sol, ou assez près de ce niveau pour que le dispositif soit d'accès facile dans un cas d'urgence.

10.12 Le Code du bâtiment de l'Ontario devrait être modifié et renvoyer à la norme ACNOR C282-1977.

10.13 Les génératrices qui n'ont pas été jugées acceptables suite aux épreuves de rendement des installations initiales de la norme ACNOR C282-1977 ou d'un manufacturier acceptable, devraient être soumises à une seule et unique épreuve conforme aux exigences de la norme de rendement des installations initiales de l'ACNOR C282-1977.

10.14 L'article 6.7.1.3 du Code de prévention des incendies de l'Ontario devrait être modifié afin qu'il y soit clairement stipulé que le rapport écrit mentionné dans la norme ACNOR C282-1977 doit être tenu à jour.

10.15 Des extincteurs automatiques à eau devraient être installés dans toutes les parties au-dessous du niveau du sol des bâtiments d'habitation de grande hauteur, y compris les aires de stationnement situées au-dessous du niveau du sol.

10.16 Si un bâtiment à logements n'a pas de balcons et n'est pas conforme aux exigences de contrôle de la fumée, tel que stipulé dans les alinéas 3.2.6.2(2) (3a) et (4) du Code national du bâtiment, les corridors des aires d'habitation devraient être divisés en au moins deux parties, et aucun compartiment ne devrait contenir plus d'une cage d'escalier d'issue.

10.17 Les sections non promulguées de la *Loi sur les commissaires d'incendie* qui donnent aux inspecteurs le pouvoir d'émettre des ordonnances exigeant conformité au Code de prévention des incendies, et qui donnent différents droits d'appel aux personnes touchées par ces ordonnances, devraient être promulguées.

Chapitre 11

11.1 La recherche de moyens de régler le degré de résistance à l'inflammabilité des meubles rembourrés devrait être intensifiée et les ressources nécessaires à ce travail devraient être mises à la disposition des chercheurs.

11.2 La recherche en vue du développement "d'une cigarette qui s'éteint d'elle-même" devrait être intensifiée et les ressources nécessaires à ce travail devraient être mises à la disposition des chercheurs.

11.3 L'éducation devrait être orientée vers une réduction de la fréquence d'un emploi insouciant du matériel de fumeur.

Chapitre 12

12.1 La province de l'Ontario devrait accroître les sommes accordées au Bureau du commissaire des incendies afin qu'il puisse engager du personnel supplémentaire, augmenter le nombre d'activités éducatives autant pour le public que pour le service d'incendie, et améliorer sa capacité d'enquêter sur les incendies qui occasionnent de grandes pertes matérielles mais aucune perte de vie humaine, les incendies criminels et autres incendies présentant un intérêt spécial.

12.2 Les citoyens de l'Ontario devraient être protégés contre les incendies de façon adéquate et proportionnée aux besoins de la municipalité.

12.3 Le Bureau du commissaire des incendies devrait élaborer une ligne d'action pour aider les services d'incendie dans la préparation de plans de prévention des incendies.

12.4 Les services d'incendie devraient élaborer des plans de prévention des incendies pour tous les bâtiments de grande hauteur.

12.5 Le Bureau du commissaire des incendies devrait déterminer les besoins des services locaux d'incendie concernant des canaux de radio supplémentaires et devrait coordonner des demandes au gouvernement fédéral pour l'allocation des canaux de radio supplémentaires.

12.6 Le Bureau du commissaire des incendies devrait développer plus à fond ses méthodes lui permettant de se tenir au courant des progrès réalisés tant au niveau de la recherche technique qu'au niveau des procédés de la lutte contre l'incendie. De même, il devrait continuer à transmettre les informations aux membres des services d'incendie municipaux responsables de l'entrainement.

12.7 A l'intérieur du service d'incendie, plus d'attention devrait être accordée à la prévention des incendies par opposition à leur extinction.

Chapitre 13

13.1 Le Bureau du commissaire des incendies devrait élaborer de la documentation à inclure au contenu des cours offerts par les collèges communautaires aux responsables de l'entretien des bâtiments. L'accent sera mis sur le contenu du Code de prévention des incendies de l'Ontario, sur les raisons et l'importance d'un entretien régulier, ainsi que sur la marche à suivre en cas d'urgence.

13.2 Les propriétaires de bâtiments à logements et à bureaux de grande hauteur devraient redoubler leurs efforts pour qu'un entrainement formel soit offert au personnel du bâtiment. Pour ce faire, ils devraient appuyer tout projet d'élaboration de cours du niveau professionnel et encourager leur personnel à y assister.

13.3 Le ministère des Collèges et Universités, avec la collaboration de représentants des propriétaires des bâtiments à logements et à bureaux de grande hauteur et toute autre personne s'occupant de l'entrainement des responsables de l'entretien des bâtiments, devrait se fixer un but à longue échéance pour l'entrainement et l'ultime certification du personnel de surveillance des bâtiments.

13.4 La province de l'Ontario, par l'entremise de la Division du Code du bâtiment du ministère des Affaires municipales et du Logement, devrait libérer des fonds pour l'entrainement des fonctionnaires responsables du Code du bâtiment de la province.

13.5 Dans le but d'avoir à leur emploi du personnel détenteur d'un certificat de responsable des bâtiments, les municipalités devraient encourager et aider les responsables des bâtiments à profiter de tous les cours qui leur sont offerts.

13.6 L'Association of Professional Engineers of Ontario (Association des ingénieurs professionnels de l'Ontario) et l'Ontario Association of Architects (Association des architectes de l'Ontario) devraient encourager les universités à mettre sur pied des cours de niveau universitaire de protection contre les incendies. Ces cours devraient toucher tant à l'aspect technique qu'à l'aspect social de la conception des bâtiments.

13.7 Toute personne qui construit, modifie ou rénove des bâtiments ou pose des installations qui percent les séparations coupe-feu devrait être avertie qu'elle met des vies en grand danger parce qu'elle n'a pas respecté les exigences du Code concernant le contrôle de la propagation de l'incendie.

13.8 Les personnes qui font l'installation ou l'entretien des réseaux d'extincteurs automatiques à eau devraient obligatoirement être détentrices d'un permis.

13.9 Les personnes qui font l'entretien ou effectuent la vérification des réseaux avertisseurs d'incendie devraient obligatoirement être détentrices d'un permis.

13.10 Le Bureau du commissaire des incendies devrait recevoir plus de fonds de façon à pouvoir réaliser un programme d'éducation du public plus positif.

13.11 Une étude devrait être réalisée afin de déterminer des méthodes d'enseignement au sujet de la protection contre les incendies qui feraient en sorte que les gens se rappelleraient des directives reçues et les mettraient en pratique en cas d'urgence.

Chapitre 14

14.1 Il devrait y avoir une participation plus forte des personnes spécialisées dans l'étude du comportement humain à l'élaboration d'un code. Leur participation devrait être établie de façon semblable à celle adoptée pour l'élaboration du NFPA Life Safety Code. De plus, des spécialistes des sciences humaines devraient participer à l'élaboration des lignes directrices des plans de sécurité incendie et des matériaux éducatifs.

14.2 L'Association canadienne des annonceurs (Canadian Association of Broadcasters) et l'Association des directeurs des nouvelles à la radio et à la télévision (Radio and Television News Directors Association) devraient être avisées du fait qu'au cours d'un incendie, les gens se tournent vers la radio et la télévision pour obtenir des informations. Les membres de ces associations devraient rencontrer les employés des services d'incendie et volontairement modifier leur façon de procéder *pendant* les incendies conformément aux connaissances qui sont acquises sur le comportement humain pendant un incendie.

14.3 L'évaluation des présentes dispositions des codes devrait être faite afin de déterminer s'il serait possible d'apporter des changements dont bénéficieraient les personnes handicapées sans pour autant réduire le niveau de protection accordé aux personnes non handicapées.

14.4 Le commissaire des incendies de l'Ontario devrait entrer en contact avec l'INCA et demander la participation de cet organisme à la préparation de brochures écrites en braille et de messages enregistrés sur bande concernant la sécurité incendie.

Chapitre 15

15.1 L'article 2.8.2.7 du Code de prévention des incendies de l'Ontario qui stipule qu'au moins un exemplaire du plan de sécurité incendie doit être affiché en permanence à chaque aire de plancher devrait être modifié. Il devrait être exigé dans cet article seulement l'affichage des mesures d'urgence à appliquer en cas d'incendie, y compris sonner l'alarme, prévenir le service d'incendie, renseigner les occupants sur la marche à suivre quand l'alarme retentit, et l'affichage des mesures à suivre dans le cas de l'évacuation des occupants qui ont besoin d'assistance.

15.2 Le Code de prévention des incendies de l'Ontario devrait être modifié afin de clarifier l'application de l'article 2.8.1.1. Il devrait être exigé, de façon très claire qu'il doit y avoir un plan de sécurité incendie pour tous les bâtiments de grande hauteur, quelle que soit la date de leur construction, qu'ils soient équipés ou non d'un réseau avertisseur d'incendie.

15.3 L'exigence du Code de prévention des incendies qui stipule que des plans de sécurité incendie doivent être élaborés pour tous les hauts bâtiments devrait être appliquée.

15.4 Les chefs des services d'incendie devraient faire tous les efforts raisonnables pour s'assurer qu'ils donnent une priorité importante à la révision et l'acceptation des plans de sécurité incendie qui leur sont remis pour approbation par les propriétaires de bâtiments qui les ont préparés.

15.5 Le Bureau du commissaire des incendies devrait compléter les lignes directrices pour l'élaboration de plans de sécurité incendie pour tout genre d'occupation aussitôt que possible et les mettre à la disposition des propriétaires de bâtiments concernés.

15.6 Le Code du bâtiment de l'Ontario devrait être modifié de façon à exiger un plan de sécurité incendie comme condition nécessaire à l'obtention d'un permis d'occupation conformément à la sous-section 2.7.1 du Code du bâtiment de l'Ontario.

L'article 18a(3) de la *Loi sur les commissaires des incendies* devrait être modifié pour permettre au Code de prévention des incendies de l'Ontario de stipuler qu'il est obligatoire qu'il y ait un plan de sécurité incendie pour les bâtiments en construction.

15.7 La définition du mot "occupant" dans le Code de prévention des incendies devrait être modifiée pour comprendre toute personne, société ou compagnie, qui occupe le bâtiment pour quelque raison que ce soit.

15.8 Les mots "locataire principal" devraient être définis dans le Code de prévention des incendies de l'Ontario et devraient comprendre toute personne, société ou compagnie qui a autorité sur une partie du bâtiment quelle qu'elle soit, y compris les personnes qui s'y trouvent.

15.9 Les alinéas 2.8.2.1(1)(c) et 2.8.3.1(1)(c) du Code de prévention des incendies de l'Ontario ne devraient pas être modifiés, et par conséquent devraient conserver la mention du mot "occupants".

15.10 Dans un plan de sécurité incendie, il devrait être fait mention de l'organisation des *principaux locataires* et de la délégation à cette organisation de la responsabilité des mesures de sécurité contre l'incendie. Les paragraphes 2.8.2.1(1) et 2.8.3.1(1) du Code de prévention des incendies de l'Ontario devraient être modifiés en conséquence.

15.11 Les ministres et les sous-ministres de chaque ministère du gouvernement provincial devraient prendre conscience des exigences du Code de prévention des incendies de l'Ontario et ils devraient encourager la participation du personnel des ministères.

15.12 C'est au propriétaire du bâtiment que devrait incomber la responsabilité d'inclure la marche à suivre pour les exercices d'incendie dans le plan de sécurité incendie. Le service d'incendie examinerait ensuite la marche à suivre proposée par le propriétaire au moment de la révision du plan de sécurité incendie soumis par le propriétaire.

15.13 Le Code de prévention des incendies de l'Ontario et la *Loi sur la sécurité incendie dans les hôtels* devraient être clarifiés afin d'imposer aux employeurs (principaux locataires) l'obligation de coopérer avec le propriétaire et d'apporter leur appui aux efforts déployés pour la tenue d'exercices d'incendie.

15.14 L'alinéa 2.8.2.4 (l) (a) du Code de prévention des incendies qui stipule que le personnel de surveillance doit recevoir des instructions au sujet de l'utilisation du réseau de communication phonique devrait être appliqué.

15.15 Une norme indépendante devrait être développée pour l'essai, l'inspection et l'entretien des réseaux de communication phonique.

15.16 Les rapports écrits que les propriétaires de bâtiments doivent tenir à jour, selon le Code de prévention des incendies de l'Ontario, devraient être demandés et examinés pendant les inspections.

15.17 Un format régulier de livre de rapport ou registre donnant la liste des *tests* exigés selon le Code de prévention des incendies de l'Ontario ainsi que la fréquence des mises à l'épreuve devrait être stipulé dans le Code de prévention des incendies de l'Ontario.

15.18 Le Code de prévention des incendies de l'Ontario devrait être modifié pour que la mention de personnes incapables de marcher au paragraphe 2.8.2.4 (l) devienne "les personnes ayant besoin d'assistance".

15.19 Les propriétaires/gérants de tous les bâtiments de grande hauteur et les occupants handicapés devraient s'assurer que la liste de tous les occupants du bâtiment qui sont handicapés, l'endroit où ils se trouvent dans le bâtiment ainsi que la description de leur handicap, soit à la disposition des pompiers quand ils répondent à un appel d'incendie.

15.20 Il devrait être interdit de verrouiller de l'intérieur les portes des cages d'escalier d'issue, sauf si le propriétaire du bâtiment peut convaincre l'autorité compétente qu'un étage particulier doit être sûr et que la sécurité ne peut être assurée par aucun autre moyen raisonnable que de verrouiller les portes des cages d'escalier d'issue.

15.21 Les portes et les trappes qui donnent sur les toits des bâtiments de grande hauteur ne devraient pas être verrouillées pendant les incendies.

15.22 Il devrait y avoir formation d'un comité pour étudier et faire des recommandations sur la possibilité d'intégrer l'utilisation d'hélicoptères pour les opérations de sauvetage au cours d'un incendie dans un bâtiment de grande hauteur. Ce comité devrait être formé de représentants des groupes concernés tels que le service d'incendie, la police, les forces armées, les conducteurs d'hélicoptères et les propriétaires de bâtiment.

15.23 Les moyens d'évacuation devraient faire l'objet d'une étude intensive au niveau du Code national du bâtiment.

15.24 Une norme de rendement pour les masques à gaz à *filtre* devrait être établie et entre-temps la Division des produits dangereux du ministère de la Consommation et des Corporations (Ottawa) devrait développer des renseignements uniformes que tous les fabricants de masques à gaz à filtre devraient être tenus de donner à leurs clients.

15.25 Les dispositifs de sortie pour les bâtiments de grande hauteur devraient être évalués par un comité composé de représentants de la Direction du Code du bâtiment et du commissaire des incendies de l'Ontario.

EPILOGUE

A mon avis, l'existence même de cette enquête publique nous permet d'être optimistes au sujet du progrès dans le domaine de la sécurité incendie. Le Docteur John Bryan a dit: "Je crois que (la sécurité incendie) a déjà été améliorée. . .vous menez cette enquête aujourd'hui et non dans six ans; ça, c'est du progrès." L'enquête a créé un forum où toutes les personnes intéressées à la sécurité incendie ont pu interagir. Il m'a semblé évident que plusieurs dossiers étaient en développement avant la tenue de l'enquête. Je crois qu'elle a servi de catalyseur pour donner un souffle nouveau à ce développement. La progression d'autres études n'était pas marquée d'urgence. A la suite de l'enquête, les personnes participants à ces études ont redéfini leurs priorités.

Ce rapport est le résultat direct et tangible du processus d'enquête. Si le rapport correspond un tant soit peu aux buts à atteindre conformément à l''arrêté en conseil, alors, l'enquête aura été bénéfique.

On peut considérer avec satisfaction la méthode choisie pour étudier et rassembler les différents problèmes. Le Docteur John Bryan a fait ce commentaire, au sujet de la valeur de la méthode employée pour l'enquête:

> "Je désire féliciter le gouvernement de l'Ontario et vous tous en tant que citoyens canadiens, pour l'attitude éclairée dont vous faites preuve en procédant à une telle enquête et une telle étude sur ce problème.
>
> Aux Etats-Unis, nous n'avons pas d'études régionales ou nationales de cette ampleur. . .sans parler de la façon dont vous la menez. . .on vous doit des félicitations non seulement parce que vous abordez ce problème, mais aussi pour la façon dont vous l'abordez, c'est cela qui m'impressionne."

J'envisage le futur avec optimisme. Plusieurs propriétaires de bâtiments de grande hauteur voient maintenant l'importance des installations de sécurité incendie. On pourra compter sur les installations améliorées si on les entretient conformément aux exigences du Code de prévention des incendies de l'Ontario. A mon avis, il y aura amélioration de la sécurité incendie dans les bâtiments de grande hauteur si l'on insiste sur les aspects humains de la sécurité incendie tel que suggéré dans le Code de prévention des incendies de l'Ontario et dans mes recommandations.

Je prévois l'interaction continuelle de changements législatifs éclairés, un accroissement de la compétence dans le domaine de la construction, de l'équipement de qualité supérieure, des méthodes d'entretien améliorées, ainsi qu'un renouvellement de l'attention accordée à la planification de la sécurité incendie comme nouvelle assise pour la sécurité incendie.

Je crois que l'on peut être satisfait des méthodes de sécurité incendie telles qu'elles existent actuellement, même avec les nombreuses insuffisances que j'ai notées. Les êtres humains sont capables de s'adapter et vont continuer à l'être. Ils peuvent réagir, et ils réagiront aux changements que subit l'environnement au cours d'un incendie. L'avenir est prometteur si le développement que j'ai observé et prédit se poursuit. Peut-être peut-on dire maintenant que les gens seront capables, s'ils en font l'effort, de répondre à cette question: "Que dois-je faire en cas d'incendie dans un bâtiment de grande hauteur?".